SELECTED

SWATERRESOURCES ABSTRACTS



VOLUME 13. NUMBER 9 MAY 1, 1980

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SELECTED WATER RESOURCES ABSTRACTS

A semimonthly publication of the Office of Water Research and Technology U.S. Department of the Interior



VOLUME 13, NUMBER 9 MAY 1, 1980

W80-03001 - W80-03300

The Secretary of the U.S. Department of the Interior has determined that the publication of the periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most our our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

S elected Water Resources Abstracts of semimonthly journal, includes abstracts of lournal elected Water Resources Abstracts, a current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographic citation and a set of identifiers or descriptors which are listed in the Water Resources Thesaurus. Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Office of Water Research and Technology.

To provide SWRA with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

The input from these Centers, and from the 54 Water Resources Research Institutes administered under the Water Research and Development Act of 1978, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies becomes the information base from which this journal is derived.

Comments and suggestions concerning the contents and arrangement of this bulletin are welcome.

Office of Water Research and Technology U.S. Department of the Interior Washington, D.C. 20240

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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A, General

THE SIMULATION OF TRANSMISSIVITY, STORATIVITY AND EVAPOTRANSPIRATION IN A DIGITAL MODEL OF A FISSURED DO-LOMITE AQUIFER NEAR NDOLA, ZAMBIA, Institute of Geological Sciences, Wallingford (Excland) (England).

For primary bibliographic entry see Field 2F. W80-03033

EFFECTS OF PARAMETER UNCERTAINTY IN A FLOW ROUTING MODEL, Institute of Hydrology, Wallingford (England). For primary bibliographic entry see Field 2E. W80-03035

KUTSE GAME RESERVE: FIELD TRIP TO A DROUGHT-PRONE ENVIRONMENT, Botswana Ministry of Local Government Lands, Gaborone.

Lands, Gaborone.
H. I. D. Vierich, and R. K. Hitchcock.
In: Proceedings Symposium on Drought in Botswana, June 5-8, 1978, Gaborone. Published by
the Botswana Society in collaboration with Clark
University Press. p 21-30, 1979. 4 Fig, 9 Ref.

Descriptors: *Droughts, *Climatology, *Migration patterns, *Botswana, *Wildlife habitats, Paleohydrology, Ecosystems, Environmental effects, Vegetation establishment, History, Kalahari Desert, Kutse Game Reserve, Africa.

The Kutse Game Reserve, covering 2,440 sq. km. in the south-central Kalahari Desert, has been subjected to both long- and short-term climatic alteration. Drought-induced changes occurring in the recent past have formed the Reserve into a good example of a drought-prone environment for sever-al reasons: (1) it is inhabited by migratory wildlife, al reasons: (1) it is inhabited by migratory wildlife, some of which are well adapted to aridity, (2) vegetation adapted to extremely dry conditions, (3) human populations subsisting by adapting, (4) animals owned by Kutse residents are usually small stock, especially goats adapted to arid conditions, (5) water-stress induced migratory patterns of both hunter-gatherer and pastoral-agricultural Kutse residents can be traced, and (6) Kutse's climatic history is etched in the landscape by fossil river valleys as well as by the vegetational history revealed by huge tree stumps which have been cut or burned. Kutse is an ideal exposition to the investigator of a semiarid ecosystem with a history of climatic, vegetational, and historical change over thousands of years. (Tickes-Arizona)

A MINI-GUIDE TO THE WATER RESOURCES OF BOTSWANA,
Department of Water Affairs, Gaborone (Botswa-

B. H. Wilson B. H. WISOh. In: Proceedings Symposium on Drought in Bo-tswana, June 5-8, 1978, Gaborone. Published by the Botswana Society in collaboration with Clark University Press. p 59-68, 1979. 32 Fig, 21 Ref.

Descriptors: *Water resources, *Mapping, *Botswana, *Groundwater, *Runoff, Droughts, Soils, Aquifers, Boreholes, Springs, Dams, Rivers.

A series of annotated maps and diagrams of the water resources of Botswana, intended to be suggestive rather than conclusive, are presented, in-cluding annual rainfall, rainfall disposition, annual rainfall probability. evanotrangulation ctuding annual raintail, raintail disposition, annual rainfall probability, evapotranspiration and rain, rivers, dams, boreholes, hand-dug wells, hafirs, springs, aquifers, water weeds, groundwater recharge, pollution, soils, and droughts. (Tickes-Ari-W80-03063

DESERTIFICATION: NATURAL OR MAN-IN-

Cambridge Univ. (England). Dept. of Geography.

A. T. Grove.

In: Proceedings Symposium on Drought in Botswana, June 5-8, 1978, Gaborone. Published by the Botswana Society in collaboration with Clark University Press. p 71-74, 1979.

Descriptors: *Descrification, *Droughts, *Environmental effects, *Biodegradation, Natural resources, Land resources, Conservation, Arid lands, Semiarid climates

Although the process of descrification has operated in the past, this century is peculiar in the severity of the risks and the extent of regions threatened by this process. The seriousness of the threatened by this process. The seriousness of the situation varies from country to country within the arid zone, one which occupies about one-third of the earth's land surface, and is greatest in the poorer semiarid lands lacking industries and without oil. It is suggested here that the imbalance among nations underlies and compounds the problems both of drought hazards and of the longer term degradation of semiarid lands. It is concluded that the present order is basically unstable, and liable to be disrupted within a period of much less than a lifetime. Under such circumstances, it is essential over the long term to conserve the natural essential over the long term to conserve the natural biological resources of the semiarid lands. (Tickes-Arizona) W80-03064

THE TRADITIONAL RESPONSE TO DROUGHT IN BOTSWANA, Botswana Ministry of Local Government and Lands, Gaborone.

R. K. Hitchcock.

In: Proceedings Symposium on Drought in Bo-tswana, June 5-8, 1978, Gaborone. Published by the Botswana Society in collaboration with Clark University Press. p 91-97, 1979. 19 Ref.

Descriptors: *Droughts, *History, *Social mobility, *Social values, Climatology, Botswana, Regional analysis.

Ethnohistorical and oral history information is the basis for this description of traditional responses in Botswana to drought, a common, almost charac-teristic phenomenon in this largely arid country. The many varied responses elucidated here range from mobility to reversion to hunting and gathering and magico-religious ceremonies for inducing rainfall. Although socioeconomic strategies may have been somewhat more effective in coping with have been somewhat more effective in coping with drought than their ideological counterparts, it is argued here that strategies such as rain making ceremonies provided people with a sense of secu-rity often strongly needed during periods of drought, and represent important mechanisms for alleviating social stress in an unpredictable envi-ronment. Traditional drought responses in Botswa-na, it is further emphasized, cannot be viewed as reparts from the political exponye of southers separate from the political economy of southern Africa. (Tickes-Arizona) W80-03067

TECHNIQUES FOR REAL-TIME OPERATION OF FLOOD CONTROL RESERVOIRS IN THE MERRIMACK RIVER BASIN,

Hydrologic Engineering Center, Davis, CA. For primary bibliographic entry see Field 6B. W80-03198

A MODEL FOR EVALUATING RUNOFF-QUALITY IN METROPOLITAN MASTER PLANNING,

Water Resources Engineers Inc., Walnut Creek, For primary bibliographic entry see Field 5B. W80-03199

ADJUSTMENT OF PEAK DISCHARGE RATES FOR URBANIZATION,

Hydrologic Engineering Center, Davis, CA. Planning Analysis Branch. D. L. Gundlach.

Technical Paper No 54, February 1979. 5 p, 3 Fig, 8 Ref, 1 Append.

Descriptors: *Urbanization, *Peak discharge, *Hydrograph analysis, *Urban hydrology, Model studies, Watersheds(Basins), Floods, Surface runoff, Runoff, Storm runoff, Hydrologic aspects, Analyt-

Various investigators have shown that changes from rural to urban conditions within a watershed, in general, significantly affect flood flows. Record-ed annual peak discharge rates (or peak discharge rates above a given base) for a basin that has been undergoing a change in land-use conditions represent a nonstationary time series. The series must be adjusted to a specific land-use condition (typically adjusted to a specific land-use condition (typically present conditions) prior to performing a statistical frequency analysis. It was the aim of this note to present a procedure utilizing a single event rainfall-runoff model for transforming recorded peak discharges at a gaging station to a consistent set that reflects existing land-use conditions. Methods presented can be used as a guide to determine an existing-condition discharge frequency curve of annual peak (or peak discharge rates above a given base) when utilizing a single event rainfall-runoff model. The multiplan-ratio option of HEC-1 permits the user to calculate systematically the hydrologic response of several storm events for a given set of land-use conditions. The adjustment procedure described is also applicable when predicting runoff for estimated future conditions. (See also W69-06445, W71-06690, W73-05381, and W75-02119) (Humphreys-ISWS)

DIRECT RUNOFF HYDROGRAPH PARAM-ETERS VERSUS URBANIZATION, Hydrologic Engineering Center, Davis, CA. Plan-ning Analysis Branch. D. L. Gundlach. Technical Paper No 48, September 1976. 5 p, 2 Fig, 2 Tab, 6 Ref, 1 Append.

Descriptors: *Urbanization, *Urban hydrology, *Hydrograph analysis, *Model studies, Storm runoff, Hydrographs, Unit hydrographs, Floods, Watersheds(Basins), Surface runoff, Analytical techniques, Analysis, Impervious surfaces.

Various rainfall-runoff models are based on the development of unit hydrographs, loss rate func-tions, and routing criteria. With models of this type, characteristics used to define the unit hydrograph, loss rate, and routing criteria need to be modified to predict runoff that would occur bemodified to predict runoff that would occur be-cause of future development within a watershed. Certain aspects of this problem, particularly changes in peak flow and lag time due to urbaniza-tion, have been treated previously. It was the aim of this note to present additional information re-garding the modification of unit hydrograph char-acteristics due to increased urbanization and to introduce techniques which can be utilized in a practical solution. Relationships presented in this paper can be used as a guide to compute the regional unit hydrograph parameters: TC(the time in hours from the end of effective rainfall to the inflection point on the recession limb of the hydroin hours from the end of effective rainfail to the inflection point on the recession limb of the hydrograph) and R (the ratio in hours of the discharge at the inflection point on the recession limb of the hydrograph to the rate of change of discharge at that point), for existing and predicted values imperviousness. Modified expressions, such imperviousness. Modified expressions, sucn as those developed, are applicable for all values of I (the percentage of impervious surface within a watershed) and the ratio of existing to future impervious surface. (See also W75-01124, W75-02119, and W75-10709) (Humphreys-ISWS)

THE EVALUATION OF A HYDRODYNAMIC WATERSHED MODEL (IHW MODEL IV), A CONTRIBUTION TO THE INTERNATIONAL HYDROLOGICAL DECADE,

nois Univ. at Urbana-Champaign. Dept. of Civil

Engineering. C. H. Hsie, V. T. Chow, and B. C. Yen. Hydraulic Engineering Series No 28, UILU-ENG-74-2013, August 1974. 154 p. 23 Fig. 3 Tab, 73 Ref, 3 Append, NSF GK-11292, GK-40867.

Descriptors: *Watersheds(Basins), *Model studies, *Hydrograph analysis, *Runoff, *Hydrology,

Field 2-WATER CYCLE

Group 2A-General

Mathematical models, Mathematical studies, Laboratory tests, Hydraulic models, Computer models, Computer programs, Discharge(Water), Hydrologic cycle, Analytical techniques, Routing, Hydraulics, Streamflow, Surface runoff, Overland flow, Flood routing, Kinematic wave model, Dynamic

This report described the mechanics of surface runoff on a laboratory watershed as simulated by two mathematical models: the dynamic wave model and the kinematic wave model. Each of mouet and the kinematic wave model. Each of these two simulation models consists of a pair of one-dimensional spatially varied unsteady flow equations that are derived from the principles of conservation of mass and momentum. In the dynamic wave model, the St. Venant form of both the continuity and momentum existing it was a conservation of the continuity and momentum existing its continuity and momentum exists. namic wave model, the St. Venant form of both the continuity and momentum equations is used; whereas in the kinematic wave model, only the continuity equation is retained in its differential form and an approximation to the momentum equation is employed. Numerical solution of these quasi-linear partial differential equations describing the flow was attained on computer by adopting an explicit characteristic method. Laboratory flow data were used to verify the validity of the analytical models and to evaluate their applicabilities. For the cases tested, fairly good agreement was found between the computed and measured results with the dynamic wave model being consistently more satisfactory and also less sensitive to the friction factor than the kinematic wave model. The rection factor than the kinematic wave model. I he relationships between peak discharges and rainfall intensity, rainfall duration, watershed surface slope, and surface roughness were also investigated by using the dynamic wave model. (Humphreys-ISWS) W80-03206

2B. Precipitation

SECONDARY PERMEABILITY AS A POSSIBLE FACTOR IN THE ORIGIN OF DEBRIS AVALANCHES ASSOCIATED WITH HEAVY RAINFALL, Everett and Associates, Rockville, MD.

A. G. Everett.

Journal of Hydrology, Vol 43, No 1/4, p 347-354, October 1979. 1 Fig, 1 Tab, 10 Ref.

Descriptors: *Excessive precipitation, *Rainfall, *Floods, *Landslides, *Debris avalanches, *West Virginia, Precipitation(Atmospheric), Soil water, Permeability, Soil water movement, Erosion, Drainage, Streams, Rivers, Runoff, Mountains, Slopes, Avalanches, Soils, Storm runoff, Secondary permeability. ary permeability.

Throughout much of the Appalachian region, heavy rainfall leads not only to flooding but also to extensive erosion and landsilding. Such a heavy rainfall occurred on August 18, 1972, in southwestern West Virginia with the heaviest rainfall and resultant damage centered over the Gilbert and Bens Creek drainages. Landslides, in the form of debris avalanches, were the principal form of mass provement during the storm A number of these movement during the storm. A number of these landslides appear to have resulted from soil zone sanusines appear to have resulted from soil zone saturation associated with temporary spring flows issuing from bedrock to the soil mantle where joints in highly fractured shales and coal beds intersected underlying, relatively unjointed, sandstones. Thus, it appears that, in this case, increased pore-water pressures as an effect of concentration of flow through secondary permeability played a substantial role in the localization and formation of slide masses. How widespread this phenomenon may be is not known. (Sims-ISWS) W80-03048

CORRELATION ANALYSIS OF THE JORDAN VALLEY RAINFALL FIELD, Hebrew Univ. (Jerusalem). Inst. of Earth Sciences.

UMI

D. Sharo Monthly Weather Review, Vol 107, No 8, p 1042-1047, August 1979. 6 Fig, 2 Tab, 7 Ref.

Descriptors: *Rainfall disposition, *Depth-area-duration analysis, *Weather patterns, Precipitation(Atmospheric), Distribution patterns,

Hydrometeorology, Topography, Jordan Valley,

A correlation analysis of the Jordan Valley Rainfall Field is presented, based upon spatial correlation function of daily rainfall both within the Valley itself and in relation to the surrounding rainfall field over the central hilly part of Israel and its downward extension deep into northern Jordan. Results derived from data for seven winter seasons between 1960 and 1967 from 92 stations indicate that rainfall patterns causing this region to helicate that rainal patterns causing this region to be an arid enclave within an area receiving up to 700mm of rain annually are independent in terms of timing of rainfall events and their characteristics such as spatial extent, intensity, and duration. This independence, relative to the surrounding uplands, is explained not only in terms of an inverse orographic effect, but also by an increase in local convec-tive activity that may be ascribed to the thermal and dynamic effects of the abrupt valley topography. (Tickes-Arizona) W80-03056

SOUTHERN AFRICAN RAINFALL: PAST, PRESENT AND FUTURE, University of the Witwatersrand, Johannesburg (South Africa). Dept. of Geography and Environ-

mental Studies.

P. D. Tyson In: Proceedings Symposium on Drought in Botswana, June 5-8, 1978, Gaborone. Published by the Botswana Society in collaboration with Clark University Press. p 45-52, 1979. 6 Fig. 7 Ref.

Descriptors: *Weather forecasting, *Rainfall, *Synoptic analysis, Climatology, curves, Distribution patterns, Africa.

Except for a restricted area along the south coast, precipitation over Southern Africa is highly seasonal in character and strongly influenced by the position of the subcontinent in relation to the pres-sure and wind systems of the southern hemisphere. Atmospheric circulation and rainfall patterns are well documented, although how the frequency of occurrence of various synoptic types has varied historically is not known. While no radical one-sided trends can be isolated in South African rainfall, quasi-periodic fluctuations appear to have per-sisted throughout the period of meteorological record and South Africa as a whole appears not to have undergone a uniform pattern of climatic change. Instead, areas of the country with different seasonal rainfall regions have behaved differently in response to different meteorological mecha-nisms, producing the rainfall associated with each regime. In the absence of any deterministic models to predict future climatic changes, the likelihood is great that the summer rainfall region of southern Africa, including Botswana, will experience a series of below-normal rainfall years in the 1980s with subsequent periods of extended drought. (Tickes-Arizona)
W80-03061

SOCIOLOGICAL ASPECTS OF DROUGHT,
University Coll. of Botswana, Gaborone. Dept. of
Sociology.

R. K. Fran. In: Proceedings Symposium on Drought in Bo-tswana, June 5-8, 1978, Gaborone. Published by the Botswana Society, in collaboration with Clark University Press. p 87-90, 1979. 14 Ref.

Descriptors: *Droughts, *Social adjustme *Social change, Psychological aspects, History.

Drought inevitably brings a host of sociological problems for which societies have devised a variety of ameliorative measures, depending on their level of development. This brief historical review indicates that while some societies have attacked the problem of drought and aridity more radically than others, it can be concluded that differing than others, it can be concluded that differing historical epochs generally have created sociocultural features enabling men to check and mitigate the effects of aridity and low rainfall. It is suggested that contemporary social problems often arise because of an imbalance developing between these societies and the environments in which they have traditionally existed. (Tickes-Arizona) W80-03066

2C. Snow, Ice, and Frost

CHARACTERISTICS OF SUBARCTIC SNOW-COVER, Saskatchewan Univ., Saskatoon. Dept. of Geogra-

phy. J. E. Fitzgibbon, and T. Dunne. Hydrological Sciences Bulletin, Vol 24, No 4, p 465-476, December 1979. 4 Fig, 5 Tab, 11 Ref.

Descriptors: *Snowpacks, *Canada, *Watersheds(Basins), *Vegetation effects, Snowmelt, On-site investigations, Analytical techniques, Water equivalent, Areal, Properties, Data collections, Snow surveys, Vegetation, Variability, Snow cover, Snow management, Forest management, Burning, Subarctic, Distribution patterns, *Schefferville(Quebec), Snowpack properties.

The areal and temporal characteristics of the snowpack in a small subarctic drainage basin at Schefferville, Quebec, were analyzed prior to and during the snowmelt in 1972 and 1973. The data showed that vegetation cover is of prime importance in determing the areal distribution of snowsnowed that vegetation cover is of prime impor-tance in determing the areal distribution of snow-pack properties. The areal distribution of snow-water equivalent could be characterized by a normal distribution in each of four vegetation cover types. It was found that the mean and standcover types. It was found that the mean and stand-ard deviation of snow water equivalent are closely related to vegetation cover. Also, mean snow water equivalent varies from year to year, but standard deviation shows no significant variation. This suggests that mean accumulation is the result of annual snowfall amounts, while the variability is due to the effects of vegetation cover and accumulation processes. The data also showed that during the snowmelt, the variability of snowcover proper-ties shows no significant change. Using the normal distributions of the peak accumulation snow water equivalents, and observed and calculated melt rates, the areal extent of snowcover was determined. (Humphreys-ISWS)

WINTER ICE JAMS ON THE GUNNISON

Bureau of Reclamation, Denver, CO. Engineering d Research Center.

Available from the National Technical Information Service, Springfield, VA 22161 as PB80-131543, Price codes: A03 in paper copy, A01 in microfiche. Report No REC-ERC-79-4, February 1979. 35 p, 26 Fig, 4 Tab, 9 Ref.

Descriptors: *Ice jams, *Colorado River, *Winter, *River flow, Frazil ice, Ice cover, Freezing, Ice loads, Ice breakup, Reservoirs, Water temperature, Climatic data, Weather, Gunnison River, Floods.

The formation, transport, and accumulation of ice on a 14 km stretch of the Gunnison River in Colorado was studied during a six year period. The Gunnison River, a principal tributary of the Colorado River, has an average elevation of 2,300 m above sea level for the area studied. Located along above sea lever for the area studied. Located along the study area are two reservoirs, the Taylor Park Reservoir which is upriver from the Blue Mess Reservoir at the lower end of the area. Winter conditions are severe with 3 days in January of 1971 having a maximum temperature of -18 C or below with the lowest temperature being -38 C. Various river characteristics. below with the lowest temperature being -38 C. Various river channelization, river snagging, and clearing operations have been performed in an attempt to reduce the ice jamming problem. Since 1967 with the filling of the Blue Mesa Reservoir descriptive records have been kept on the winter large summaries of these annual descriptions ice jams. Summaries of these annual descriptions are included. Study results show that the elevation of the Blue Mesa Reservoir at the end of Novemof the Blue Mesa Reservoir at the end of November is a major factor in determining the location of the ice jam head at the start of the season. The higher the reservoir, the further upstream the ice jam starts. Clearing and snagging operations have had little effect on reducing the jamming, however, the construction of larger ice collection areas has helped. A good correlation was observed between upstream ice jam movement and average temperature below minus 10 C. Large releases from the Taylor Park Reservoir during the winter contribute to the ice formation problem. Data summaries, maps, and photographs are included. (Seigler-IPA)

WORLD DATA CENTER A FOR GLACIOLOGY (SNOW AND ICE), NEW ACCESSIONS LIST

NO. 4. Colorado Univ., Nederland. Inst. of Arctic and Alpine Research. September 1979. 110 p.

L'escriptors: *Glaciology, *Snow, *Ice, *Bibliographies, Computers, Snow cover, Glaciers, Avalanches, Polar regions, Sea ice, Permafrost, Adstracts, Data collections, Publications, Paleoglacio-

The quarterly list of documents acquired by the Data Center during the period April-June 1979 has been published. Books, technical reports, conference proceedings, and reprints were included; most journal articles have not been indexed. Entries are listed by author and subject. Due to space considerations, however, complete bibliographic information for a document, is given only under the erations, nowever, complete biolographic mior-mation for a document is given only under the author entry. The subject headings are those used by the U.S. Army Cold Regions Research and Engineering Laboratory in their Bibliography on Cold Regions Sciences and Technology. (Prece-ISWS W80-03208

2D. Evaporation and Transpiration

A SENSITIVITY ANALYSIS OF THE PENMAN-MONTEITH ACTUAL EVAPOTRAN-SPIRATION ESTIMATES, Institute of Hydrology, Wallingford (England).

Journal of Hydrology, Vol 44, No 3/4, p 169-190, December 1979. 10 Fig, 22 Ref, 2 Append.

Descriptors: *Evapotranspiration, *Model studies, *Hydrology, Data collections, Input-output analysis, Humid climates, Temperate, Canopy, sis, Humid climates, Temperate, Canopy, Watersheds(Basins), Equations, *Sensitivity analy-"Retraiteus (Basins), Equations, "Sensitivity analysis, "Penman-Monteith equation, Systeme hydrologique europeen, Error variance, Humid temperate region, Aerodynamic resistance, Canopy resistance.

A brief description was given of the evapotranspir-ation component, based on the Penman-Monteith autor components, osseu on the rental additional equation, of the distributed Systeme Hydrologique Europeen model of catchment hydrology. The importance of evapotranspiration predictions to the operation of the model was stressed, together with expected error variance associated with estimates of evapotranspiration. The sensitivity of such estiof evapotranspiration. The sensitivity of such estimated model parameter values can be investigated. It was shown that for dry canopy conditions at three sites within a broadly humid temperate region, the sensitivity of Penman-Monteith estimates of evapotranspirations. of Penman-Monteith estimates of evapotranspira-tion to different input data and parameters is very dependent on the values of the aerodynamic and canopy resistance parameters that introduced the influence of vegetation type into the predictions. For forest surfaces, in particular, the evapotran-spiration predictions were highly sensitive to values of the canopy resistance, so that accurate estimation of this parameter was important. (Rob-erts-ISWS)

2E. Streamflow and Runoff

EFFECTS OF PARAMETER UNCERTAINTY IN A FLOW ROUTING MODEL, Institute of Hydrology, Wallingford (England). P. Whitehead, G. Hornberger, and R. Black. Hydrological Sciences Bulletin, Vol 24, No 4, p 445-464, December 1979. 12 Fig. 25 Ref.

Descriptors: *Routing, *Model studies, *Australia, Runoff, Hydrologic systems, Parametric hydrology, Monte Carlo method, Flow, Hydrology, Flow routing models.

A Monte Carlo simulation approach was used to investigate the effects of parameter uncertainty in a nonlinear storage' flow routing model on downstream flow prediction. The analysis was oriented stream flow prediction. The analysis was oriented towards a study of the problem of routing the measured discharge hydrograph at Hughes Bridge on the Murray River, Western Australia, to an ungauged point some 36 km downstream, but implications of the results pertain to broader issues of flow routing in inadequately gauged rivers. The downstream flow predictions were insensitive to N, the number of reaches into which the river segment is divided, and, for small perturbations in inflow, were also relatively insensitive to a and b, travel time parameters. Peak flow predictions, however, depended strongly on the values of a and b, and consequently accurate flood prediction required careful determination of these parameters. The estimate of the 'gain' in discharge at a downstream station due to lateral inflow in the river stream station due to lateral inflow in the river segment is also subject to considerable uncertainty, and mis-estimates of this parameter can result in poor predictions of downstream flows. (Lee-ISWS) W80-03035

SECONDARY PERMEABILITY AS A POSSI-BLE FACTOR IN THE ORIGIN OF DEBRIS AVALANCHES ASSOCIATED WITH HEAVY

Everett and Associates, Rockville, MD. For primary bibliographic entry see Field 2B. W80-03048

HYDROLOGIC DATA FOR FLOODS OF JULY 1978 IN SOUTHEAST MINNESOTA AND SOUTHWEST WISCONSIN, Geological Survey, St. Paul, MN. Water Re-sources Div. V. J. Latkovich.

Available from OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225. Microfiche \$3.50, printed copy \$4.00. Geological Survey, open-file report 79-1166, 1979. 29 p. 18 Fig. 2 Tab.

Descriptors: "Hydrologic data, "Historic floods, "Minnesota, "Wisconsin, "Thunderstorms, Flood profiles, Flood damage, Documentation, Stage-discharge relations, Flood frequency, Sediments, Aerial photography, Current meters, Indirect flood measurement, Gaging stations, Peak discharge, Flood recurrence interval, "Southeast Minnesota, "Southwest Wisconsin."

Intense storms of July 1978 caused floods of historical significance in southeast Minnesota and southwest Wisconsin. Local, State, and Federal officials need data and information to evaluate, coordinate, and manage programs concerned with floods and flood losses. Because of a need to document stream discharges, elevations, and sedi-ment concentrations, current-meter and indirect ment concentrations, currienteer an indirect measurements were made at 34 gaging stations during or immediately after the floods. This report summarizes some of the hydrologic data collected. Peak discharges of record occurred at 20 gaging Peak discharges of record occurred at 20 gaging stations. Frequency of peak discharge equaled or exceeded the 100-year recurrence interval at 11 stations. The Federal Benchmark gaging station on the North Fork Whitewater River was destroyed. Five people died as a result of the floods, and property damages were estimated to exceed \$114 million. Thirty-three counties were officially declared disaster areas. (Kosco-USGS) W80-03158

FLOODS IN PUERTO RICO, MAGNITUDE

AND FREQUENCY, Geological Survey, Tampa, FL. Water Resources Div.; and Geological Survey, Fort Buchanan, PR. Water Resources Div.

water Resources Div.

M. A. Lopez, E. Colon-Dieppa, and E. D. Cobb.

Available from the National Technical Information

Service, Springfield, VA 22161 as PB-300 855,

Price codes: A04 in paper copy, A01 in microfiche.

Streamflow and Runoff-Group 2E

Geological Survey Water-Resources Investigations 78-141, June 1979. 66 p. 13 Fig. 3 Tab, 59 Ref.

Descriptors: *Floods, *Flood frequency, *Puerto Rico, *Regression analysis, *Regional analysis, Peak discharge, Streamflow, Gaging stations, Watersheds(Basins), Drainage area, Rainfall-runoff relationships, Frequency curves.

Annual-peak discharge records at 50 sites in Puerto Rico with five or more years of record were used to determine individual site log-Pearson type III frequency curves. The frequency curve values for 2-, 10-, 25-, 50-, and 100-year recurrence intervals at 37 sites with 10 or more years of record were at 37 sites with 10 or more years of record were regressed against basin characteristics. Drainage area and mean annual rainfall proved to be the only independent variables significant at the 95 percent confidence level in these regression equations. (Woodard-USGS)

FLOW ROUTING IN THE SUSQUEHANNA RIVER BASIN: PART II LOW-FLOW FRE-QUENCY CHARACTERISTICS OF THE SUS-QUEHANNA RIVER BETWEEN WAVERLY, NEW YORK AND SUNBURY, PENNSYLVA-

Geological Survey, Harrisburg, PA. Water Resources Div. For primary bibliographic entry see Field 6A. W80-03163

UNSTEADY STREAMFLOW MODELING GUIDELINES, Nevada Univ. System, Reno. Water Resources Center; and Nevada Univ. System, Reno. Dept. of Center, and Civil Engineering.
V. L. Gupta, S. M. Afaq, J. W. Fordham, and J.

No. Federici.
Journal of Hydrology, Vol 43, No 1/4, p 79-97,
October 1979. 14 Fig, 4 Tab, 16 Ref. OWRT A057-NEV(4), B-096-NEV(1).

Descriptors: *Streamflow, *Floods, *Model studies, *Mathematical models, *Nevada, Rivers, Lakes, Flow, Historic floods, Hydrographs, Synthetic hydrology, Analytical techniques, Mathematics, Hydrology, *Truckee River(NV).

Presented was a case study of one-dimensional modeling of spatially varied unsteady flow regime in a river, utilizing the continuity and momentum formulations of Saint-Venant equations. The emphasis was on sensitivity analyses of the modeling framework for obtaining guidelines for modeling exercises. Finite-difference schemes were compared relative to their efficacy in simulating flow regimes. Model response was examined with receipings. regimes. Model response was examined with re-spect to changes in six parameters, namely: (1) grid size; (2) lateral inflow or outflow rates; (3) discrete size; (2) micrai inflow or outflow rates; (3) discrete and composite description of hydraulic elements; (4) discrete and composite description of bed slopes; (5) roughness coefficient of stream bed; and (6) magnitude of weighting parameter. (Sims-ISWS) W80-03167

HYDRAULIC GEOMETRY AND CARRYING

HYDRAULIC GEOMETRY AND CARRYING CAPACITY OF FLOODPLAINS, Illinois State Water Survey, Urbana.

N. G. Bhowmik, and J. B. Stall.

Available from the National Technical Information Service, Springfield, VA 22161 as PB80-140841, Water Resources Center, University of Illinois, Urbana Research Report No 145, September 1979, 147 p. 120 Fig. 6 Tab, 64 Ref, Append. OWRT B-100-ILL(3), 14-34-0001-7153.

Descriptors: *Floodplains, *Hydraulic geometry, Stream order, Cross-sections, Depth, Width, Car-rying capacity, Floods, Humid areas, Streams, Hypsometric analysis, Incision, Flow duration.

Hydraulic geometry relationships for floodplains of nine river basins in Illinois and four river basins outside of the state were developed. Relationships between floodplain width, cross-sectional area, sur-face area, depth, sinuosity, incision, and stream order have been developed. These hydraulic ge-

Group 2E-Streamflow and Runoff

ometry parameters were also found to be related to the drainage area of the individual stream seg-ments. Hydraulic geometry coefficients of the floodplains of Illinois streams were found to be similar although the developed relationships have different base values. Hypsometric analyses of the Illinois streams indicated that most of the stream in Illinois streams indicated that most of the stream in Illinois are in a mature stage of development. All of the hydraulic geometry parameters of the flood-plains increased in the downstream direction. However, for some rivers, the cross-sectional areas showed an increase in the downstream direction up to a certain distance and then it decreased to some extent near the mouth of the river. Comparison of the hydraulic geometry parameters of the flood-plains and the main streams indicated that the plains and the main streams indicated that the hydraulic geometry parameters of the floodplains increased at a lower rate in the downstream direc tion than did the corresponding parameters of the main streams. Actual field data related to the carmain streams. Actual netd chart related to the car-rying capacity of floodplains were analyzed to determine the distribution of flow in the main channel and in the floodplains. The carrying ca-pacity of floodplains can vary anywhere from a few percent to more than 80 percent of the total flow for the data analyzed for this research. W80-03172

ESTIMATING MICRO-RELIEF SURFACE STORAGE FROM POINT DATA, Minnesota Univ., St. Paul. Dept. of Agricultural

Engineering.
I. D. Moore, and C. L. Larson.

Transactions of the American Society of Agricultural Engineers, Vol 22, No 5, p 1073-1077, September-October 1979. 2 Fig, 3 Tab, 11 Ref.

Descriptors: *Runoff, *Depression storage, *Soil surfaces, *Model studies, Mathematical models, Surface drainage, Storage, Soils, Infiltration, Depression, Rainfall, Farm management, Agriculture, Agricultural runoff, Micro-relief surface storage.

A distributed model for calculating surface storage A distributed model for calculating surface storage and runoff amounts for a plot from grid elevations was developed. The model, which operates independently of rainfall and infiltration rates, was applied to field observations on 16 plots, before and after rainfall application. The results showed that limited themself. that limited runoff occurs concurrently with buil-dup of micro-relief storage. Percent of area contributing runoff increases by steps. Micro-relief storage was increased 3 to 4 times by plowing, but was substantially reduced by subsequent rainfall. (Sims-ISWS)

EVALUATION OF TVA STREAMFLOW MODEL ON SMALL KENTUCKY WATER-

Kentucky Univ., Lexington. Dept. of Agricultural

Engineering.
J. R. Nuckols, and C. T. Haan

JMI

Transactions of the American Society of Agricultural Engineers, Vol 22, No 5, p 1097-1105, September-October 1979. 3 Fig, 4 Tab, 11 Ref.

Descriptors: *Streamflow, *Runoff, *Watersheds(Basins), *Kentucky, *Mathematical models, Model studies, Evaluation, Flow, Storm runoff, Rainfall, Evapotranspiration, Drainage, Groundwater, Streams, Rivers, Hydrology.

The TVA Daily Streamflow Simulation Model was evaluated on six Kentucky watersheds. Results indicate that the model is reasonably easy to apply and produces simulation results that are in fair agreement with daily flows and good agreer with monthly and annual flows. (Sims-ISWS) W80-03182

RELATIONSHIPS BETWEEN STREAM DIS-CHARGE AND YIELD OF DISSOLVED SUB-STANCES FROM A COLORADO MOUNTAIN

WATERSHED,
Colorado Univ., Boulder. Dept. of Environmental,
Population, and Organismic Biology.
For primary bibliographic entry see Field 5B.

A SIMPLIFIED MODEL FOR THE GENERA-TION OF DAILY STREAMFLOWS, Lancaster Univ., Bailrigg (England). Dept. of En-vironmental Sciences.

D. M. Sargent. Hydrologic Sciences Bulletin, Vol 24, No 4, p 509-527, December 1979. 14 Fig, 5 Tab, 7 Ref.

Descriptors: *Streamflow, *Hydrology, *Streamflow forecasting, Hydrographs, Model studies, Analytical techniques, Hydrologic data, Mathematical models, Flow measurement, Computer models, Statistical methods, River flow, *Streamflow data, *England, Daily flow model.

A technique for generating sequences of daily streamflows was presented which preserves the important characteristics of the daily flow hydroimportant characteristics of the daily flow hydro-graph by the use of a number of simple processes. The daily flow model was applied, in conjunction with a disaggregation model to preserve statistics of monthly and annual flows, to historic data for a river in the northwest of England. Several sets of synthetic data generated by the model were tested for their acceptability. (Lee-ISWS) W80.03195

TECHNIQUES FOR REAL-TIME OPERATION OF FLOOD CONTROL RESERVOIRS IN THE MERRIMACK RIVER BASIN, Hydrologic Engineering Center, Davis, CA. For primary bibliographic entry see Field 6B. W80-03198

ADJUSTMENT OF PEAK DISCHARGE RATES FOR URBANIZATION,

Hydrologic Engineering Center, Davis, CA. Planning Analysis Branch. For primary bibliographic entry see Field 2A. W80-03200

DEVELOPMENT OF GENERALIZED FREE SURFACE FLOW MODELS USING FINITE ELEMENT TECHNIQUES, Hydrologic Engineering Center, Davis, CA. For primary bibliographic entry see Field 2H. W80-03201

DESIGN OF FLOOD CONTROL IMPROVE-MENTS BY SYSTEMS ANALYSIS: A CASE

Hydrologic Engineering Center, Davis, CA. H. O. Reese, A. V. Robbins, J. R. Jordan, and H.

Technical Paper No 51, October 1971. 21 p, 6 Fig,

Descriptors: *Flood control, *Systems analysis, *Mississippi, *Model studies, Flood damage, Hydrologic aspects, Economics, Mathematical models, Design, Analytical techniques, Methodology, Channel improvement, Flood protection, Stream improvement, *Tibbe River(MS), Case

A hydrologic-economic simulation model was de-A hydrologic-economic simulation model was developed to evaluate alternative protection schemes in the design of an authorized federal flood control project for 125 miles of the Tibbee River Flood plain in Mississippi. The model requires input consisting of unit hydrographs, streamflow routing coefficients and storage functions, a pattern storm, rainfall loss rate functions, and flow-damage-frequency relations. A single synthetic pattern storm was used in conjunction with flow-forement. quency relations. A single synthetic pattern storm was used in conjunction with flow-frequency curves at index locations to generate a series of floods for comparing alternative protection schemes with existing conditions. The effect of channel improvements on flood runoff characteristics was evaluated by using storage routing func-tions that account for changes in storage-discharge relations. Upstream channel improvement works for flood control would tend to increase the magnitude of peak flow rates now experienced on the Tibbee River main stem. They would also tend to increase the average annual flood damages on the main stem unless it was enlarged to accommodate the increased discharges. (Humphreys-ISWS)

EFFECTS OF DAM REMOVAL: AN APPROACH TO SEDIMENTATION, Hydrologic Engineering Center, Davis, CA. For primary bibliographic entry see Field 2J. W80-03204

DIRECT RUNOFF HYDROGRAPH PARAM-ETERS VERSUS URBANIZATION, Hydrologic Engineering Center, Davis, CA. Plan-ning Analysis Branch. For primary bibliographic entry see Field 2A. V80-03205

THE EVALUATION OF A HYDRODYNAMIC WATERSHED MODEL (IHW MODEL IV), A CONTRIBUTION TO THE INTERNATIONAL HYDROLOGICAL DECADE, Illinois Univ. at Urbana-Champaign. Dept. of Civil For primary bibliographic entry see Field 2A. W80-03206

2F. Groundwater

THE SIMULATION OF TRANSMISSIVITY, STORATIVITY AND EVAPOTRANSPIRATION IN A DIGITAL MODEL OF A FISSURED DO-LOMITE AQUIFER NEAR NDOLA, ZAMBIA, Institute of Geological Sciences, Wallingford (Explex) (England).

(England).

B. Adams, and R. Kitching.

Hydrological Sciences Bulletin, Vol 24, No 4, p
487-498, December 1979. 9 Fig, 1 Tab, 5 Ref.

Descriptors: *Evapotranspiration, *Simulation analysis, *Transmissivity, Digital computers, Dolomite, Karst, Fissures(Geologic), Aquiiers, Rainfall, Calibrations, *Storativity, *Karstic aquifers, *Zambia, Digital model, Fissured dolomite, Dolomite aquiifers, Kakontwe dolomite, Field evidence, Soil moisture deficits, Polygonal nodal system.

The application of nonlinear transmissivity and storativity functions in a digital groundwater model of a fissured dolomite near Ndola, Zambia, was described. A digital model calibration problem was solved by using methods based on a knowledge of field conditions. The transmissivity and storativity functions were adequate to model the third spatial coordinate in what was essentially a thrito spatial coordinate in what was essentially a two-dimensional (in space) mathematical solution to a natural phenomenon, i.e., groundwater flow through a karstic aquifer. These functions were based on an understanding of the behavior of karstic aquifers and evidence from borehole logs within the area. The use of root constants and of the facility of modeling soil moisture deficits, and have a solute assection experience in the same accused. hence actual evapotranspiration, was also a logical and justifiable technique for the construction of digital models of aquifer systems. (Roberts-ISWS) W80-03033

GROUNDWATER: NEW DIRECTIONS--WHERE WE'VE BEEN AND WHERE WE'RE GROUNDWATER: GOING.

Journal of Hydrology, Vol 43, No 1/4, p 555-569, October 1979. 10 Ref.

Descriptors: *Groundwater, *Research and development, *Aquifer management, *United States, Hydrogeology, History, Documentation, Publications, Groundwater resources, Brine disposal, Water storage, Hydraulics, Saline water intrusion, Model studies, Underground storage intrusion, Model studies, Underground storages and the storage of th age, Natural gas storage, Heat storage

During Burke Maxey's lifetime the potentiometric analysis of groundwater problems, pioneered by Theis, was completely worked out by theoreticians. Such 'macro-methods' are now taught in universities and are widely used. In the future they will be supplemented by 'micro-methods' that are site specific and best described as involving miscible displacement: a well-known application is the leach mining of copper or uranium. Saline aquifers are already used for the storage of natural gas and as permanent containments for liquid wastes.

Groundwater-Group 2F

Future uses of such aquifers will include storage of freshwater and, possibly more important, storage of hot water (water that has been heated by waste heat from generating plants or industrial plants) for later retrieval and use in space heating and other applications of low-grade heat. All of these possibilities offer unexplored fields of research to the imaginative and innovative investigator. All of these possibilities offer an unexcelled opportunity for failure. The era of the use of miscible displacement in porous media is just beginning. (Humphreys-ISWS)
W80-03037

DEPRESSURIZATION OF A MULTI-LAY-ERED ARTESIAN SYSTEM FOR WATER AND GROUT CONTROL DURING DEEP MINE-SHAFT DEVELOPMENT,

Dames and Moore, Phoenix, AZ. W. M. Greenslade, and G. W. Condrat. Journal of Hydrology, Vol 43, No 1/4, p 517-536, October 1979. 4 Fig. 7 Tab, 5 Ref.

Descriptors: *Mining, *Mine water, *Dewatering, *New Mexico, Pumping, Drawdown, Aquifers, Artesian aquifers, Groundwater, Groundwater movement, Velocity, Pressure, Geology, On-site investigations, Hydrology, Depressurization, Mine shafts, Uranium mining.

Uranium in the Grants Mineral Belt of northwest-ern New Mexico is explored from progressively greater depths. As mining depths increase, more aquifers and higher hydrostatic heads are encoun-tered. Water control during mine shaft sinking is critical to successful shaft development. Field testing procedures were designed to produce data on aquifer coefficients, groutability, and rock strength appropriate to the short-term construction period involved in shaft sinking. Design coefficients were selected on the basis of field and laboratory test selected on the basis of field and laboratory test results and regional geohydrology. The uranium ore is located between 915 and 1220 m (3000 and 4000 ft) below the surface. The geology of the area studied comprises alternating marine and nonmarine sandstone, siltstone, and shale. The ore is located in the lowermost of six major aquifers identified. A depressurizing system was designed to reduce the hydrostatic pressure and shaft water inflow from each of the aquifers. The groundwater velocity across the shaft was maintained below 0.61 m/day (2 ft/day) and minimized movement of grout away from the shaft. (Sims-ISWS) W80-03038

GEOTHERMAL WELL TESTING, California Univ., Berkeley. Lawrence Berkeley

Lab.
T. N. Narasimhan, and P. A. Witherspoon.
Journal of Hydrology, Vol 43, No 1/4, p 537-553,
October 1979. 10 Fig. 15 Ref, DOE W-7405-Eng-

Descriptors: *Geothermal studies, *Thermal water, *Wells, *Test wells, Aquifer testing, Thermal springs, Temperature, Pressure, On-site investigations, Equipment, Flow, Groundwater, Geology, Hydrogeology, Geothermal wells, Well testing.

Just as in the case of hydrogeology and petroleum engineering, well testing is an invaluable tool in assessing the resource deliverability of geothermal reservoirs. While the techniques of production testing and interference testing already developed in hydrogeology and petroleum engineering provide a strong foundation for geothermal well testing, the latter is challenged by some special problems. These special problems stem primarily from the difficulties associated with the measurement of mass flow rate, pressure, and temperature under the hostile environment prevalent within geothermass flow rate, pressure, and temperature under the hostile environment prevalent within geother-mal wells. This paper briefly looked into the state of the art of geothermal well testing and provided a few illustrative field examples. (Sims-ISWS) W80-03039

SIMULATED CHANGES IN POTENTIOME-TRIC LEVELS RESULTING FROM GROUND-WATER DEVELOPMENT FOR PHOSPHATE MINES, WEST-CENTRAL FLORIDA,

Geological Survey, Tampa, FL. W. E. Wilson, and J. M. Gerhart. Journal of Hydrology, Vol 43, No 1/4, p 491-515, October 1979. 13 Fig. 1 Tab, 10 Ref.

Descriptors: *Potentiometric level, *Computer models, *Florida, *Pumping, *Phosphates, *Mining, Transmissivity, Storage coefficient, Hydraulic conductivity, Water table, Steady flow, Unsteady flow, Model studies, Aquifers, Water yield, Floridan aquifer.

yield, Floridan aquifer.

A digital model of two-dimensional groundwater flow was used to predict changes in the potentiometric surface of the Floridan aquifer resulting from groundwater development for proposed and existing phosphate mines during 1976-2000. The modeled area covers 15,379 sq km in west-central Florida. In 1975, groundwater withdrawn from the Floridan aquifer for irrigation, phosphate mines, other industries, and municipal supplies averaged about 28,500 1/s. Withdrawals for phosphate mines are expected to shift from Polk County to adjacent counties to the south and west, and to decline from about 7,620 1/s in 1975 to about 7,060 1/s in 2000. The model was calibrated under steady-state and transient conditions. Input parameters included aquifer transmissivity and storage coefficient; thickness, vertical hydraulic conductivity, and storage coefficient of the upper confining bed; altitudes of the water table and potentiometric surface; and groundwater withdrawals. Simulation of November 1976 to October 2000, using projected combined pumping rates for existing and proposed phosphate mines, resulted in a rise in the potentiometric surface of about 6 m in Polk County, and a decline of about 4 m in parts of Manatee and Hardee counties. (Visocky-ISWS) W80-03040 W80-03040

CONNECTOR WELLS, A MECHANISM FOR WATER MANAGEMENT IN THE CENTRAL FLORIDA PHOSPHATE DISTRICT, LaMoreaux (P. E.) and Associates, Inc., Tusca-For primary bibliographic entry see Field 4B. W80-03041

THE IMPACTS OF COAL STRIP MINING ON THE HYDROGEOLOGIC SYSTEM OF THE NORTHERN GREAT PLAINS: CASE STUDY OF POTENTIAL IMPACTS ON THE NORTH-ERN CHEYENNE RESERVATION, Nevada Univ. System, Las Vegas. Water Re-

sources Center.
For primary bibliographic entry see Field 5B. W80-03042

PROBLEMS OF LARGE-SCALE GROUND-WATER DEVELOPMENT, Hebrew Univ., Jerusalem (Israel). Center for Groundwater Research.

For primary bibliographic entry see Field 4B. W80-03043

THE VOLUME-AVERAGED MASS-TRANS-PORT EQUATION FOR CHEMICAL DIAGEN-ETIC MODELS, Illinois Univ. at Urbana-Champaign. Dept. of Ge-

ology. For primary bibliographic entry see Field 5B. W80-03044

TIME-DEPENDENT SORPTION ON GEO-LOGICAL MATERIALS, Nevada Univ. System, Reno. Water Resources

Center. For primary bibliographic entry see Field 5B. W80-03045

ARSENIC SPECIES AS AN INDICATOR OF REDOX CONDITIONS IN GROUNDWATER, Waterloo Univ. (Ontario). Dept. of Earth Sciences. For primary bibliographic entry see Field 2K. W80-03046

SEASONAL CHEMICAL AND ISOTOPIC VARIATIONS OF SOIL CO2 AT TROUT CREEK, ONTARIO, Waterloo Univ. (Ontario). Dept. of Earth Sciences. E. J. Reardon, G. B. Allison, and P. Fritz. Journal of Hydrology, Vol 43, No 1/4, p 355-371, October 1979. 9 Fig, 22 Ref.

Descriptors: *Soil gases, *Carbon dioxide, *Isotope studies, *Groundwater, Soil water, Soils, Water levels, Sampling, On-site investigations, Data processing, Analytical techniques, Precipitation(Atmospheric), Soil moisture, Water chemistry, Soil carbon dioxide.

The partial pressure of carbon dioxide in soil gas and its 13C isotopic composition were monitored in a sandy calcareous soil during 1977-1978. These measurements were coupled with chemical and isotopic analyses of groundwater from a watertable piezometer. The 13C isotopic composition of the groundwater at the water table is in apparent equilibrium with the soil zone CO2 gas phase. The P sub CO2 is primarily controlled by root respiration, diffusive loss to the atmosphere, and uptake by the aqueous phase. Steep P sub CO2 gradients towards the water table are evident during periods by the aqueous phase. Steep P sub CO2 gradients towards the water table are evident during periods of low CO2 production in the root zone. By early spring, diffusive loss of CO2 along these gradients extends to depths of 7 m or more. During the growing season this gradient is reversed, resulting in CO2 buildup below the root zone. Below a depth of 7 m, soil CO2 content showed little seasonal change. Leaching of soil carbonate extends to depths of 2 m or more in the study area. A rapid neutralization of slightly acid soil water by soil carbonate as the water is displaced across the leached-unleached zone boundary due to recharge soil carbonate as the water is displaced across the leached-unleached zone boundary due to recharge events is believed to account for the deposition of iron and manganese oxides at this interface. Saturation of soil water with respect to calcite is attained in the unsaturated zone, and a state of supersaturation is reached by the time the soil water reaches the water table. Two mechanisms may account for this supersaturation: (1) slow dissolution of dolonity by infiltrating with water after calcite saturations. mite by infiltrating soil water after calcite satura-tion is reached; and (2) CO2 degassing of soil water in response to CO2 loses from the soil profile during fall and winter. (Sims-ISWS) W80-03047.

EVALUATION TECHNIQUES OF FRAC-TURED-ROCK HYDROLOGY,

H. E. LeGrand. Journal of Hydrology, Vol 43, No 1/4, p 333-346, October 1979. 4 Fig. 5 Ref.

Descriptors: *Groundwater, *Fractures(Geologic), *Fracture permeability, *Southeast U.S., Rocks, Groundwater movement, Permeability, Geology, Evaluation, Porous media, Hydrogeology, Archydrogeology, Hydrology.

Areas in which fractured rocks are part of the hydrologic circulatory system are widespread. Certain aspects of the historical features of hydrol-Certain aspects of the historical features of hydrology tend to influence fractured rocks, and the results of these influences in turn control certain aspects of applied hydrology. The dynamic changes in the fractured-rock system can be cast in spatial relations that are usefully studied in the field and in the context of their historical development. For example, circulating water in carbonate rocks causes enlargement of fractures by solution and the development of secondary permeability that further influences movement and storage of water, solutes moving in fractures of less soluble rocks control the degree of development of overlying control the degree of development of overlying insoluble residue, and to the degree present, this insoluble residue, and to the degree present, this residue forms another type of sub-surface water medium that must be considered with the fractured-rock system. The treatment of fracture systems of consolidated rocks in a way similar to porous granular media, in a context of fractures analogous to pores strictly a matter of scale, is not an adequate base for analyzing problems of fractured-rock hydrology. A key problem is the uneven distribution of permeability, a condition resulting from geologic and hydrologic processes since consolidation of the rock. Classifying the patterns of uneven distribution lead to appropriate patterns of uneven distribution lead to appropriate models on which useful mean values and devi-

Field 2-WATER CYCLE

Group 2F—Groundwater

ations can be described. Reconstruction of the hydrogeologic history of a fractured-rock system provides an elegant foundation for the evaluation of the existing hydrology. (Sims-ISWS)

REGIONAL CARBONATE FLOW SYSTEMS IN

NEVADA, Nevada Univ. System, Las Vegas. Water Resources Center. M. D. Mifflin, and J. W. Hess. Journal of Hydrology, Vol 43, No 1/4, p 217-237, October 1979. 4 Fig, 3 Tab, 42 Ref.

Descriptors: *Groundwater, *Aquifers, *Carbonate rocks, *Nevada, *Great Basin, Water supply, Water resources, Geology, Stratigraphy, Permebility, Caves, Wells, Springs, Bedrock, Groundwater movement, Water chemistry, Dissolved solids Teitum Hudgeberg, Hudgeberg, Hudgeberg, Purple on Programmer of the Programmer of th solids, Tritium, Hydrology, Hydrogeology.

Carbonate rocks include some of the most extensive and productive aquifers in the world. In Nevada, the limited surface water supply has been extensively developed, and most of the alluvial groundwater basins are used to the point of estimated perennial yield, thus are closed to further development. Based on the review of over 570 geologic/hydrologic references, 150 petroleum wildcat test-hole records, and cave and carbonate spring data, it is believed that deep regional carbonate aquifers exist and that they are potentially flavorable for development for water supplies. Apbonate aquifers exist and that they are potentially favorable for development for water supplies. Approximately the eastern one-third of Nevada (105,000 sq km) is underlain by carbonate rock. Eastern Nevada lies within the miogeosynclinal belt of the cordilleran geosyncline, in which 9,000-12,000 m of marine sediments accumulated during the Precambrian and Paleozoic. Two major periods of deformation have affected the region. Cave, wildcat well, and carbonate spring data indicate that the Cambrian and Devonian carbonate strata may generally have the highest permeability. Water quality at depth in general ranges between Water quality at depth in general ranges between 300 and 600 mg/l TDS. A 'Phase II' project has been designed to further these investigations and will increase our understanding of large regional carbonate aquifers in the Great Basin. (Sims-ISWS)

UTILITY OF A COMPUTERIZED DATA BASE FOR HYDROGEOLOGIC INVESTIGATIONS, LAS VEGAS VALLEY, NEVADA, Office of Radiation Programs, Las Vegas, NV. R. F. Kaufmann, and H. N. Friesen. Journal of Hydrology, Vol 43, No 1/4, p 195-216, October 1979. 8 Fig, 1 Tab, 13 Ref, EPA R800946.

Descriptors: *Groundwater, *Data collections, *Data storage and retrieval, *Nevada, Stratigraphy, Permeability, Transmissivity, Water quality, Water balance, Wells, Water wells, Well data, Water levels, Pumping, Drawdown, Storage, Data processing, Computers, Hydrology, Hydrogeology, *Las Vegas(NV).

Hydrogeologic study of the shallow groundwater zone in Las Vegas Valley, Nevada, involved dezone in Las Vegas Valley, Nevada, involved de-velopment of an extensive computerized data base consisting of water analyses and water-well logs. The data were manipulated and reduced using a variety of graphical and statistical techniques ap-plicable to analysis of spatial and temporal changes in water quality. Stratigraphic relations, permeabil-ity/transmissivity variations, water budgets, and ambient quality relative to drinking-water stand-ards were evaluated as part of an overall EPA funded study to determine the sources and extent of groundwater contamination and develop man-agement alternatives to minimize adverse effects. agement alternatives to minimize adverse effects. Extension of the data base to include investigations concerned with improved definition of the strati-graphic and structural makeup of the valley and to applied study of water quality, subsidence, and water banking seems reasonable. (Sims-ISWS)

JMI

MEASUREMENT OF FLUID VELOCITY USING TEMPERATURE PROFILES: EXPERIMENTAL VERIFICATION,

Illinois State Geological Survey, Urbana.

K. Cartwright.

Journal of Hydrology, Vol 43, No 1/4, p 185-194,
October 1979. 5 Fig. 12 Ref.

Descriptors: "Groundwater movement, "Velocity, "Water temperature, "Illinois, Wells, Water wells, Groundwater, On-site investigations, Test wells, Geology, Aquifers, Heat, Heat transfer, Temperature, Hydraulic conductivities, Hydrology, Temperature profiles.

Temperature profiling has been used to predict the rate and direction of groundwater movement. A controlled field experiment was conducted to ascertain the validity of the rate calculations made using this method. The vertical velocity, or leakage, of groundwater between two aquifers was calculated utilizing both hydrologic and temperature measurements in a well drilled into the Paw Paw buried bedrock valley in northern Illinois. The experiment showed that accurate estimates of leakage can be made in stable boreholes where leakage can be made in stable boreholes where there are no geologic complications. Estimates utithere are no geologic complications. Estimates utilizing temperature and hydrologic methods produced similar results for one of two aquicludes. However, the methods produced dissimilar results for the second aquiclude. It was speculated that the presence of a thin organic silt caused most of the problem; other complicating factors were lithologic variation and a very low hydraulic gradient. Nevertheless, the method appears to have great promise in many geologic environments. (Sims-ISWS) W80-03052

PROGRESS IN ANALYTICAL GROUND-WATER MODELING,
Upper Mississippi River Basin Commission, Twin
Cities, MN.
W. C. Walton.
Journal of House,

Journal of Hydrology, Vol 43, No 1/4, p 149-159, October 1979. 4 Tab, 47 Ref.

Descriptors: *Mathematical models, *Ground-water, *Analytical techniques, *Reviews, Model studies, Wells, Water wells, Groundwater move-ment, Aquifers, Artesian aquifers, Injection wells,

Analytical models simulating the flow of ground-water to and from wells and streams, land subsidence due to artesian pressure decline, conserva-tive solute transport to and from wells, and heat transport to and from wells have been developed for many aquifer systems, well and stream condi-tions. These models are useful, though limited in application, for aquifer-test analysis, simple aquifer system evaluation, and numerical computer model design and calibration. Accelerated progress in analytical model development and application is called for particularly regarding flow in leaky arte-sian aquifers, conservative and nonconservative solute transport and transfer, and heat transport. (Sims-ISWS)

THE MEINZER ERA OF U.S. HYDROGEO-LOGY, 1910-1940, Nevada Univ. System, Reno. Desert Research Inst.

G. B. Maxey.

Journal of Hydrology, Vol 43, No 1/4, p 1-6,
October 1979. 10 Ref.

Descriptors: *Hydrogeology, *United States, *History, *Groundwater, Documentation, Publications, Analytical techniques, Groundwater movement, Hydrologic budget, Groundwater resources,

Acceleration of agricultural, industrial, and municipal development following the American Civil War resulted in unprecedented demands for knowledge of movement, occurrence, quality, and availability of groundwater. By 1910, response to this demand resulted, in government, in establishment of specialized agencies. The agency most affecting development of hydrogeology was the Ground Water Division of the U.S. Geological Surve, especially after appointment of O.E. Surve, especially after appointment of O.E. Meinzer as Chief in 1912. The Division established

a system utilizing geologists and engineers (later other scientists) working as teams to assess ground-water resources. The U.S. Geological Survey developed cooperative programs allowing State Engineers and geologists to participate in resource studies, an effective way of encouraging interest in hydrogeological problems as well as establishing a strong funding base. By 1940, resource evaluation studies numbered into the hundreds and, more important, a sound scientific and engineering basis for hydrogeology was established. Contributions were made by scientists in the petroleum industry chiefly in movement of fluids through porous media (works of M. Muskat and M.K. Hubbert and associates). Also C.F. Tolman and associates made media (works of M. Muskat and M.K. ruubert and associates). Also C.F. Tolman and associates made contributions in special areas (water supply, saltwater intrusion, land subsidence). By 1940, qualitative hydrology was well developed and do-cumented, and a firm base for quantitative work was established. Contributions were made to spewas established. Contributions were made to spe-cialized studies including budget methods, subsi-dence, saltwater intrusion, pumping effects, model development, and water quality. Printed summa-tions of the 'state of the art' in 1940 include O.E. Meinzer in Physics of the Earth (1942) and Tol-man's Groundwater of 1937. (Humphreys-ISWS) W80-03054

GROUNDWATER FLOW SYSTEMS IN THE WESTERN PHOSPHATE FIELD IN IDAHO, Idaho Univ., Moscow. Mining and Mineral Re-sources Research Inst. D. R. Ralston, and R. E. Williams. Journal of Hydrology, Vol 43, No 1/4, p 239-264, October 1979. 13 Fig, 3 Tab, 6 Ref.

Descriptors: *Groundwater, *Hydrogeology, *Phosphates, *Mining, *Idaho, Geology, Groundwater flow, Baseflow, Spring, *Subsurface drainage, Discharge(Water), Water quality, Mine wastes, Phosphorus, Phosphorus compounds, Aquifers, Hydrology, *Blackfoot River Basin(ID).

Aquifers, Hydrology, *Blackfoot River Basin(ID). The complex geologic setting of the western phosphate field in Idaho provides the environment for equally complex groundwater flow systems. This research was initiated in 1974 to provide general and detailed hydrologic data on specific areas to aid in understanding the water-resource systems in the western phosphate field. Geologic, hydrogeologic, and hydrologic data were collected in Little Long Valley and Lower Dry Valley in the Blackfoot River Basin. Two groundwater flow systems are important in relation to the present and proposed mining in Little Long Valley: (1) the local shallow flow systems in the western ridge; and (2) the intermediate flow system in the Dinwoody Formation on the eastern ridge. The baseflow of Angus Creek in Little Long Valley is dependent on the groundwater flow systems in both ridges during the first one or two months following snowmelt. The baseflow of the stream is almost completely dependent on the intermediate flow system in the eastern ridge for the rest of the year. Care must be taken to avoid creating groundwater flow systems in any waste piles constructed as part of the mining activity. Drainase from a waste-pile flow systems in any waste piles constructed as part of the mining activity. Drainage from a waste-pile flow system would probably be poorer quality than water from natural flow systems in the area. (Sims-ISWS)

POTENTIOMETRIC SURFACE OF THE MIS-SISSIPPIAN AQUIFER IN PARTS OF TRIGG, LYON, CALDWELL, AND CHRISTIAN COUN-TIES, MISSISSIPPIAN PLATEAU REGION, TIES, MISS KENTUCKY,

Geological Survey, Paducah, KY. Water Resources Div.

Geological Survey Water-Resources Investigations 78-25 (open-file report), 1978. 3 Sheets, 17 Ref.

Descriptors: *Potentiometric level, *Kentucky, *Maps, *Contours, *Groundwater movement, Karst, Drilling, Depth, Bedrock, Sandstones, Limestones, Domestic water, Livestock, Water pollution, Water quality, *Mississippian Plateau Region(KY), Mississippian aquifer(KY), Cumberland River basin(KY), Lake Barkley(KY).

Water In Soils-Group 2G

Ground-water levels in a 600 square mile area of ordenin-water heefs in a own square inneares of the Cumberland River drainage basin in parts of Trigg, Lyon Caldwell, and Christian Counties, Mississippian Plateau Region, Kentucky are shown by means of contours on the potentiometric surby means of contours on the potentiometric surface. Generaly, ground water moves toward and with the surface drainage to Lake Barkley and the Cumberland River. The potentiometric map indicates a minimum drilling depth to water. The bedrock is composed largely of sandstone, cavernous limestone, or jointed and fractured limestone. All of these rock types yield sufficient water for domestic and stock purposes. The cavernous limestone is extremely vulnerable to pollution. (Kosco-USGS)
W80-03155

AVAILABILITY AND QUALITY OF WATER FROM SHALLOW AQUIFERS IN DUVAL COUNTY, FLORIDA, Geological Survey, Tallahassee, FL. Water Re-

sources Div.

sources Div.
L. V. Causey, and G. G. Phelps.
Available from the National Technical Information
Service, Springfield, VA 22161 as AD-A075 819,
Price codes: A03 in paper copy, A01 in microfiche.
Geological Survey Water-Resources Investigations
78-92, 1978. 36 p, 11 Fig, 7 Tab, 20 Ref.

Descriptors: *Groundwater availability, *Water quality, *Aquifer systems, *Florida, *Aquifer characteristics, Hydrogeology, Groundwater recharge, Analytical techniques, Aquifer testing, Sites, Water yield, Transmissivity, Petrology, Domestic water, Industrial water, *Floridan aquifer, *Duval County/Fla, *Jackson/ille/Fla). County(Fla), *Jacksonville(Fla).

The shallow-aquifer system in Duval County, Fla overlies the Florida aquifer and is composed chief overlies the Florida aquifer and is composed chief-ly of sand, clay, sandy clay, and limestone. Thick-ness of the system ranges from about 300 to 600 feet. The upper 150 feet of deposits, consisting of the water-table and shallow-rock zones, are the most dependable and economical source of supple-mental water supply. The principal shallow water-bearing zone is a limestone bed 40 to 100 feet below land surface. Aquifer tests conducted at 13 sites in Duval County show that yields from the shallow aquifer vary from place to place within the county owing chiefly to variations in lithology of the saturated rocks and sediments. The limestone the saturated rocks and sediments. The limestone of the shallow-rock zone will yield as much as 200 of the shallow-rock zone will yield as much as 200 gallons per minute to wells; the maximum yield at most of the sites tested was between 30 and 100 gallons per minute. The water-table zone generally yields 10 gallons per minute or less but at one site, where a water-table well tapped a shell bed near land surface, the well yielded more than 40 gallons per minute. The quality of water in the shallow aquifer system in Duval County is generally acceptable for most domestic, commercial, and industrial uses. In some places, however, it has a high iron concentration and is hard. The iron concentration exceeds 0.3 milligrams per liter in water from non concentration and is hard. The iron concentra-tion exceeds 0.3 milligrams per liter in water from the water-table or shallow-rock zones at 7 of the 13 aquifer test sites. The hardness of water from the aquifer ranges from about 60 to about 180 milligrams per liter. (Kosco-USGS) W80-03157

ESTIMATED DRAWDOWNS IN THE FLORI-DAN AQUIFER DUE TO INCREASED WITH-DRAWALS, DUVAL COUNTY, FLORIDA, Geological Survey, Tallahassee, FL. Water Re-

sources Div. For primary bibliographic entry see Field 6A. W80-03165

GROUND-WATER TRACERS--A SHORT

REVIEW, Arizona Univ., Tucson. Dept. of Hydrology and Water Resources. Water Resources.
S. N. Davis, G. M. Thompson, H. E. W. Bentley,

and G. Stiles.
Ground Water, Vol 18, No 1, p 14-23, January-February 1980. 1 Fig, 3 Tab, 39 Ref.

Descriptors: *Groundwater, *Groundwater move-ment, *Tracers, *Reviews, Suspended solids, Spores, Bacteria, Dyes, Dye releases, Water tem-

perature, Chemicals, Stable isotopes, Radioisotopes, Gases, Hydraulic conductivity, Hydrology, Fluorocarbons.

Tracers are used widely to determine the direction and velocity of groundwater movement. Failures of tracer tests are most commonly a result of incorrect choice of tracers, insufficient concentrations of tracers, and a lack of an understanding of the hydrogeologic system being tested. Some of the most useful general tracers are bromide, chloride, rhodamine WT, and various fluorocarbons. For certain purposes, dyed club-moss spores and baker's yeast have proved valuable. Many radionuclides including 3H, 23Hr, and 198Au are almost ideal for numerous purposes, but radiation hazards associated with their use together with local. State. ideal for numerous purposes, but radiation hazards associated with their use together with local, State, and Federal regulations have discouraged widespread field applications in recent years within the United States. (Sims-ISWS) W80-03187

GRAVITY SURVEY OF A DEEP BURIED VALLEY, South Florida Univ., Tampa. Dept. of Geology. M. T. Stewart. Ground Water, Vol 18, No 1, p 24-30, January-February 1980. 9 Fig, 1 Tab, 17 Ref.

Descriptors: *Gravity studies, *Groundwater, *Aquifers, Sands, Gravels, Bedrock, Geology, Data collections, On-site investigations, Data processing, Well data, Water wells, Water resources, Hydrology, *Outagamie County(WI).

Hydrology, *Outagamie County(WI).

A gravity survey was conducted as part of a groundwater investigation covering 400 sq mi (1,000 sq km) in Outagamie County, northeastern Wisconsin. The objective of the gravity survey was to supplement bedrock topography data obtained from well logs and seismic refraction profiles. The gravity method was chosen as it is a rapid and low cost reconnaissance technique, and conditions in the study area were favorable for a successful gravimetric survey. The simple Bouguer gravity values were referenced to a local base station as only relative gravity values were required. The data were interpolated to a regular grid by an inverse-distance weighted average algorithm. The gravity residual was derived using a five-ring inverse weighted filtering routine. The residual map accurately reflects the major topographic features of the bedrock surface. A two-dimensional geologic model fitted to the residual data agrees well with the simple flat plate approximation used to obtain quantitative estimates of glacial drift thickness. Estimates of drift thickness from the gravity data also agree well with bedrock depths obtained from well logs. The most producive drift aquifers are restricted to the major bedrock valleys. Gravity data were coupled with seismic refraction and well data to produce a bedrock rock valleys. Gravity data were coupled with seis-mic refraction and well data to produce a bedrock elevation map, from which it is possible to predict the extent and distribution of the major drift aquifers. (Sims-ISWS) W80-03188

GROUND-WATER SALINITY PROBLEMS RE-LATED TO IRRIGATION IN THE COLORADO

Tennessee Valley Authority, Norris, TN. Office of Natural Resources.
For primary bibliographic entry see Field 5G.
W80-03189

POTENTIAL USE OF DIGITAL COMPUTER GROUND WATER MODELS, Hydrologic Engineering Center, Davis, CA. Plan-ning Analysis Branch. D. L. Gundlach. Technical Paper No 52, April 1978. 34 p, 3 Fig, 1 Teb. 20 Bef.

Tab. 20 Ref.

Descriptors: *Model studies, *Groundwater, *Aquifers, *Systems analysis, *New Mexico, Computer models, Water quality, Mathematical models, Costs, Groundwater movement, Aquifer systems, Aquifer characteristics, Hydraulic conductivity, Groundwater recharge, Flow system, *Albuquerque(NM), Two-dimensional model, Three-dimensional model.

The discussion on the potential use of digital computer groundwater models was prepared for the Albuquerque District, Corps of Engineers, Albuquerque, New Mexico, as part of a water supply study of the Albuquerque Greater Urban Area (AGUA). Although the material presented was developed for the Albuquerque area, the concepts are applicable to the understanding of groundwater modeling generally. The discussion included both quantity and quality models and reasons why an agency may wish to undertake a modeling effort. Available computer programs were cited, and the probable advantages and disadvantages of specific programs were given. Costs for prior modeling efforts of groundwater systems in other localities were also included as a guide to probable costs when considering the use of a digital computer The discussion on the potential use of digital comwhen considering the use of a digital computer groundwater model. (Humphreys-ISWS) W80-03202

OCCURRENCE, QUALITY, AND QUANTITY OF GROUND WATER IN WILBARGER COUNTY, TEXAS,

Texas Dept. of Water Resources, Austin. For primary bibliographic entry see Field 7C. W80-03209

2G. Water In Soils

MODEL DEVELOPMENT FOR PREDICTING SOIL MOISTURE BY THERMOGRAPHY, South Dakota State Univ., Brookings. Dept. of For primary bibliographic entry see Field 7B. W80-03007

SEASONAL CHEMICAL AND ISOTOPIC VARIATIONS OF SOIL CO2 AT TROUT CREEK, ONTARIO,

Waterloo Univ. (Ontario). Dept. of Earth Sciences. For primary bibliographic entry see Field 2F. W80-03047

SOIL SEDIMENT DEPOSITS IN SUBSURFACE

Science and Education Administration, Brawley, CA. Imperial Valley Conservation Research For primary bibliographic entry see Field 4A. W80-03178

ESTIMATING MICRO-RELIEF SURFACE STORAGE FROM POINT DATA,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2E.
W80-03179

SIMULATION OF NITROGEN AND PHOS-PHORUS LEACHING FROM POULTRY

Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W80-03181

LANDSLIDE-PRONE SOILS OF SOUTHWEST-ERN PENNSYLVANIA, Pennsylvania State Univ., University Park. Dept.

of Agronomy. E. J. Ciolkosz, G. W. Petersen, and R. L.

Cunningham. Soil Science, Vol 128, No 6, p 348-352, December 1979. 4 Fig, 2 Tab, 25 Ref.

Descriptors: *Landslides, *Expansive clays, *Regression analysis, *Pennsylvania, *Soil profiles, *Ohio, *West Virginia, *Kentucky, Statistical methods, Wetting, Drying, Soil analysis, Slow flowage, Sliding, Slickensides, Clay content.

Upshur, Vandergrift, Guernsey, and Library soils are found in southwestern Pennsylvania and in Ohio, West Virginia, and Kentucky. These soils have high clay contents, high COLE values, and

Field 2-WATER CYCLE

Group 2G-Water In Soils

slickensides, and are landslide-prone. The move-ment caused by the wetting and drying of expand-able clays, combined with gravitational forces, ini-tiates the downslope soil movement and the forma-tion of slickensides. Cavode and Wharton soils also tion of stickensides. Cavode and Wharron soils also have high clay contents, but they are not landslide-prone. The clay mineralogy of the landslide-prone soils is of an expandable type, and that of the cavode and Wharton is primarily nonexpandable. Thus the landscape instability of the landslide-prone soils is a function of high clay content, with high processions of the clay being of an expandable. a high proportion of the clay being of an expand-able type. (Visocky-ISWS) W80-03190

SORPTION OF WATER IN SOILS: A COM-PARISON OF TECHNIQUES FOR SOLVING THE DIFFUSION EQUATION,

Guelph Univ. (Ontario). Dept. of Land Resource

D. E. Elrick, and K. B. Laryea.
Soil Science, Vol 128, No 6, p 369-374, December 1979. 2 Fig, 3 Tab, 13 Ref.

Descriptors: *Sorption, *Soil water movement, *Unsaturated flow, *Mathematical models, *Computer programs, Numerical analysis, Diffusion, puter programs, Numerical analysis, Diffusion, Equations, Soil water, Simulation analysis, Absorption, "Continuous System Modeling Program(CSMP), Quasi-analytical solution, Per-

The flow of water in unsaturated soils is governed by the nonlinear diffusion equation. Four different methods for solving this equation were compared. Results within 1% of one another were generally obtained. An improved simulation procedure was described in detail. (Visocky-ISWS) W80-03192

2H. Lakes

UMI

A THEORY OF THE MEAN FLOW DRIVEN BY LONG INTERNAL WAVES IN A ROTAT-ING BASIN, WITH APPLICATION TO LAKE KINNERET.

Woods Hole Oceanographic Institution, MA. Joint Program in Physical Oceanography. H. W. Ou, and J. R. Bennett.

Journal of Physical Oceanography, Vol 9, No 6, p 1112-1125, November 1979. 12 Fig, 9 Ref, BNL 357213-S,NOAA 03-022-57, NSF OCE76-01813.

Descriptors: *Lakes, *Water circulation, *Internal waves, *Model studies, Theoretical analysis, Mathematical models, Thermocline, Winds, Temperature, Water temperature, Limnology, *Lake Kinneret(Israel), Kelvin waves.

The rectified flow induced by wind-driven internal seiches in a rotating lake was studied. Friction and nonlinearity combine to generate a secondary mean flow which was calculated analytically for the case of a uniform depth lake and numerically for variable depth. The theory was applied to Lake Kinneret, the former Sea of Galilee, where the diurnal wind forcing produces a large internal Kelvin wave and which has a strong cyclonic mean flow. The uniform depth model serveduces mean flow. The uniform depth model reproduces the diurnal response adequately, but variable depth is required to reproduce the mean flow. (Si W80-03032

AMAZON LAKES: WATER STORAGE AND NUTRIENT STRIPPING BY ALGAE, Duke Univ., Beaufort, NC. Marine Lab For primary bibliographic entry see Field 5C.

OXYGEN DEFICIT-PHOSPHORUS LOADING RELATION IN LAKES, Washington Univ., Seattle.

For primary bibliographic entry see Field 5B.

IMPACT OF DEVELOPMENT ON WATER-SHED HYDROLOGIC AND NUTRIENT BUD-GETS,

Wisconsin Univ.-Madison. Center for Biotic Sys-For primary bibliographic entry see Field 5B. W80-03186

DEVELOPMENT OF GENERALIZED FREE SURFACE FLOW MODELS USING FINITE ELEMENT TECHNIQUES,

Hydrologic Engineering Center, Davis, CA. D. M. Gee, and R. C. MacArthur. Technical Paper No 53, July 1978. 18 p, 12 Fig, 4 Tab, 14 Ref.

Descriptors: *Mathematical models, *Finite element analysis, *Free surfaces, Hydrodynamics, Model studies, Equations, Flow, Analytical techniques, Analysis, Velocity, Reservoirs, Distribution patterns, Open channel flow, Continuity equation, Momentum equation.

Two finite element hydrodynamic models, one for Iwo mute element nyarodynamic models, one tor two-dimensional free surface flow in the horizontal plane and one for the vertical plane, are being evaluated. This paper presented recent results of evaluation and application of the models. The work to date with the horizontal flow model indicates the following: (1) Internal continuity errors can be reduced to acceptable levels by increasing network detail, particularly in areas of large curvanetwork defail, particularly in areas of large curva-ture of the velocity field. (2) Errors in continuity tend to be reflected more strongly in the velocity than the depth. (3) General application of the model to steady state simulations is feasible at present. The preliminary work with the vertical flow models indicates the following: (1) The finite element method model is less costly than the finite element method model is less costly than the finite element method model is less costly than the timite difference model for steady state solutions. (2) Simulation of flows in which density gradients are important requires careful selection of turbulent exchange and eddy diffusion coefficients. (3) The finite element model predicts larger vertical velocities than the finite difference model, perhaps due to ties than the finite difference model, perhaps due to the retention of the vertical momentum equation. (4) More experience with, and development of, the vertical models will be required before 'produc-tion' applications can be easily made. Indicated areas of further work are: (1) Verification of models' performance when an adequate data set becomes available. (2) Development of guidance on selection of turbulent exchange coefficients, relationship to flow properties, etc. (3) Investiga-tion of models' behavior for dynamic simulations. (4) Evaluation of use of stagnation vs. slip bound-ary conditions in the finite element models. (3) Extension of simulations with the vertical models to variable breadth problems. (Humphreys-ISWS) to variable breadth problems. (Humphreys-ISWS) W80-03201

2I. Water In Plants

FOREST OVERSTORY VEGETATION AND ENVIRONMENT ON THE MISSOURI RIVER FLOODPLAIN IN NORTH DAKOTA, North Dakota State Univ., Fargo. Dept. of Botany

W. C. Johnson, R. L. Burgess, and W. R.

Ecological Monographs, Vol 46, No 1, p 59-84, Winter, 1976. 11 Fig, 8 Tab, 82 Ref. OWRT A-022-NDAK(4).

Descriptors: *Missouri River, *Flood plains, *Forests, *Trees, *Ecology, Rooted aquatic plants, Wetlands, Rivers, Ecological distribution, Succession, Meanders, Soils, Floods, Nutrients, Reservices

Structure and composition of forest overstory are strongly related to stand age and position on the floodplain. Populus deltoides and Salix amygdaloides predominate in young stands which generally occur on low terraces near the center of the floodplain. Fraxinus pennsylvanica var. lanceolata, Acer negundo, Ulmus americana and Quercus ma-Acer hegulated, offices allerteaths and guertes accrocarps replace Populus and Salix through time and predominate in old stands on high terraces near the edge of the floodplain. The soils of young

stands are generally sandy and low in organic matter. Soil nutrient content and available water capacity are generally higher in older stands be-cause of higher organic matter content and repeat-ed inputs of nutrient-rich silts from past floods. ed inputs of nutrent-rich sits from past floods. Tree species diversity initially increases as stands age and reaches a maximum in stands with mix-tures of both pioneer and terminal species. Variety and evenness follow a similar pattern. A recent decline in the establishment of small stems of Acer and Ulmus, a decline in the diameter growth rate for Acer, Ulmus and Fraxinus and a lack of seedling sapling stands of Populus in the region appear to be the result of the presence and operation of reservoirs. (Stihler-Mass) W80-03168

2J. Erosion and Sedimentation

WILLAMETTE RIVER SEDIMENT MANAGE-MENT POSSIBILITIES: PHASE I -- PROBLEM CLARIFICATION, Oregon State Univ., Corvallis. Water Resources

arch Inst.

Research Inst.
P. C. Klingerman.
Available from the National Technical Information
Service, Springfield, VA 22161 as PB80-139611,
Price codes: A03 in paper copy, A01 in microfiche.
Project Completion Report, October 1979. 18 p, 8
Ref, 2 Append. OWRT A-999-ORE(24).

Descriptors: *Oregon, *Sediment control, *Information exchange, *River flow, Documentation, Banks, Riparian land, Aggregates, Gravels, Water management(Applied), Project planning, Fisheries, Sediment transport, Sediment distribution, Ero-

Descriptive materials developed as a part of an information dissemination project on sediment management for the Willamette River in Oregon are presented. Much conflict over the management of the river, its water, bed, and banks has existed for several years. Groups interested in the river include the construction agreement industry. Inch. for several years. Groups interested in the river include the construction aggregate industry, fish-revaluation aggregate industry, fish-revaluation in the first actual quantitative information on sediment transport and erosion existed so a project was organized to: (1) clarify the sediment transport regime of the river; (2) identify and prioritize the quantitative information required for decisionmaking; and (3) demonstrate what can be done with various kinds of information to improve the basis for decisionmaking. Project activities designed to assemble and disseminate information included workshops, conferences, and news coverage. A workshops, conferences, and news coverage. A copy of a talk, 'Willamette River Challenges', used copy of a task, winamette Kiver Chainenges, used at a conference is given. In the talk the physical processes shaping the river and the dynamic nature of the processes are discussed. River management approaches and tasks are identified and challenged. Also presented is a composite of presentations made to technical or industrial groups. This document 'Willamette River Gravel -- Resource Management Needs' is more technical than the first and includes specific action recommendations. (Seigler-IPA) W80-03008

EFFECTS OF STEM DENSITY UPON SEDI-MENT RETENTION BY SALT MARSH CORD-GRASS, SPARTINA ALTERNIFLORA LOISEL, Virginia Univ., Charlottesville. Dept. of Environmental Sciences For primary bibliographic entry see Field 4D. W80-03026

IMPACTS OF OFF-ROAD VEHICLES ON IN-FILTRATION AND SEDIMENT PRODUCTION OF TWO DESERT SOILS, Nevada Univ. System, Reno. Renewable Natural

Resources Div. R. E. Eckert, Jr., M. K. Wood, W. H. Blackburn,

and F. F. Peterson.

Journal of Range Management, Vol 32, No 5, p 394-397, Sept 1979, 2 Fig, 2 Tab, 19 Ref.

Descriptors: *Environmental effects, *Desert soils, *Off-road vehicles, *Soil mechanics, *Soil manage-

ment, Recreation, Soil stabilization, Simulated rainfall, Nevada, Infiltration rates, Sedimentation rates.

Although scientists generally agree that off-road vehicle (ORV) traffic is damaging to fragile desert habitats, many of the actual site-specific effects of such activity are unknown. Accordingly, the objective of this study was to evaluate the initial impacts of two types of ORVs: motorcycle and 4-wheel drive traffic, on the infiltration rate and sediment production characteristics of two desert soils in response to simulated rainfall. The study sediment production characteristics of two desert soils in response to simulated rainfall. The study was conducted at two sites in southern Nevada on two major types of surface soils: the coppice soil on the low small dunes under shrubs, and the mostly barren interspace soil between shrubs. Motorcycle (50 passes), truck (20 passes), and control treatments were imposed in August 1975 at both locations, at the Blue Diamond site again in January 1976, and at the Crystal Springs site again in April 1976. Different dates were used in 1976 to obtain similar surface moisture conditions on the two sites at time of treatment. Results indicated two sites at time of treatment. Results indicated that infiltration was similar for both soils although that infiltration was similar for both soils although more sediment was produced from the surface with exposed mineral soil than from the gravel-mulched surface. Infiltration was from 3-13 times greater on the coppice soil than on the interspace soil, while sedimentation was 10-20 times greater on the interspace soil. Infiltration was less and sediment yield greater after soil was disturbed by vehicular traffic and after reformation of surface crust, particularly on interspace soil. It is concluded that ORV traffic is a major factor in the management of recreation lands, and ways must be found to reduce the damage. (Tickes-Arizona) W80-03057

FILTRATION OF SEDIMENT BY SIMULATED VEGETATION II. UNSTEADY FLOW WITH NON-HOMOGENEOUS SEDIMENT,

Kentucky Univ., Lexington. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 4D. W80-03177

SOIL SEDIMENT DEPOSITS IN SUBSURFACE

Science and Education Administration, Brawley, CA. Imperial Valley Conservation Research Center. For primary bibliographic entry see Field 4A. W80-03178

TILLAGE SYSTEM EFFECTS ON SEDIMENT AND NUTRIENTS IN RUNOFF FROM SMALL WATERSHEDS.

Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W80-03183

EFFECTS OF DAM REMOVAL: AN APPROACH TO SEDIMENTATION, Hydrologic Engineering Center, Davis, CA D. T. Williams.

Technical Paper No 50, October 1977. 31 p, 17 Fig, 10 Ref, 1 Append.

Descriptors: *Model studies, *Sediment transport, *Dams, *Idaho, Hydraulic structures, Analytical techniques, Analysis, Rivers, Hydraulics, Mathematical models, Computer models, On-site investigations, Effects, Data collections, Sediment discharge, Particle size, Streambeds, Dam removal.

In recent years hydraulic structures such as dams have been removed due to deterioration, increased maintenance cost, or obsolescence. Investigation of the hydraulic, hydrologic, and sediment transport consequences of the removal of these structures have been very limited, thus necessitating the es-tablishment of analytical techniques and procedures to predict adequately these effects. A mathematical model (HEC-6) was selected because of its success in the prediction of sediment transport when applied to a wide variety of cases. The removal of the Washington Water Power Dam (WWPD) on the Clearwater River near Lewiston,

Idaho, was selected for study. Procedures and techniques of calibration and verification developed, comparison of actual and predicted volume of sediment transported, where the sediment scoured or deposited, and their rates were presentation. There was discussion of the applicability of the model to this type of problem, limitations of a one-dimensional model, and interpretation of the results. The comparison of measured and computed final bed elevations, with the dam removed, was very satisfactory. Overall long range trends for each operating condition was as expected. The calculated rate of scour was accurate at the WWPD site (River Mile 4.62) but lagged by approximately ten months at other upstream sections. proximately ten months at other upstream sections. This difference can be attributed to localized sour and 'layering' of the bed particle distribution. Neither can be modeled by HEC-6. Some of the variations in the rate of soour and deposition can be attributed to the limitations of a one-dimensional model. al model. (Humphreys-ISWS) W80-03204

WATER SPRINGS AUGUSTINATIONS ASSESSED.

2K. Chemical Processes

ARSENIC SPECIES AS AN INDICATOR OF REDOX CONDITIONS IN GROUNDWATER, Waterloo Univ. (Ontario). Dept. of Earth Sciences. J. A. Cherry, A. U. Shaikh, D. E. Tallman, and R. V. Nicholson.

Journal of Hydrology, Vol 43, No 1/4, p 373-392,
October 1979. 8 Fig, 4 Tab, 28 Ref.

Descriptors: *Water chemistry, *Arsenic compounds, *Oxidation-reduction potential, *Groundwater, Chemistry, Chemicals, Indicators, Sampling, Laboratory tests, Hydrogen ion concentration, Electrochemistry, Thermodynamics, Analytical techniques. ical techniques

Although the thermodynamically based concept of Attnough the thermodynamically based concept or oxidation-reduction potential has for many decades been an accepted tool for interpretation of the chemistry of hydrochemical systems, attempts at measurement of actual redox levels in natural waters have been fraught with difficulty. Existing methods of measurement involve use of potential-sensing inert metal electrodes or analytical determination of redox includes a consideration and the discourage and the discourage and the sensitivity. methods of measurement involve use of potential-sensing inert metal electrodes or analytical determination of redox-indicator species such as dissolved 0.2 or Fe(2+) or redox couples such as SO4(2-)—HS(-) and HCO3(-)—CH4. As a result of recent advances in analytical methods, it is now possible to determine the concentrations of both As(III) and As(V) at sufficiently low levels so that the apparent redox condition, as pE or Eh, can be computed from measured concentrations of As(III) and As(V) species. The arsenic pE or Eh domain obtained using published thermodynamic data for As species and the assumption of redox equilibrium provides a basis for obtaining an indication of redox levels within the central portion of the redox level suithin the central portion of the redox as 1-10 micrograms/liter the domain has significant extent. Oxidation and reduction of As(III) and As(V) in laboratory trials with redox agents common to natural waters, such as O2, H2S, and Fe, suggest that oxidation or reduction of As species in natural waters occur at rates sufficiently the period of th Fe, suggest that oxidation or reduction of As spe-cies in natural waters occur at rates sufficiently slow to enable water samples to be collected, trans-ported, and analyzed before excessive change in species distribution takes place, but rapid enough for As species to adjust to the dominant redox condition of the water if periods of years or longer are available for equilibration. Because of the long equilibration time and the position of the pE-pH domain for the As couple, groundwater is best suited for use of As as a redox indicator. (Sims-ISWS) ISWS) W80-03046

2L. Estuaries

EFFECTS OF STEM DENSITY UPON SEDI-MENT RETENTION BY SALT MARSH CORD-GRASS, SPARTINA ALTERNIFLORA LOISEL, Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 4D. W80-03026

TIDAL DYNAMICS AND LOW-FREQUENCY EXCHANGES IN THE ARANSAS PASS.

Harbor Branch Foundation, Inc., Fort Pierce, FL. N. P. Smith.

Estuaries, Vol 2, No 4, p 218-227, December 1979.

10 Fig, 2 Tab, 14 Ref.

Descriptors: *Tidal waters, *Inlets(Waterways), *Texas, *Gulf of Mexico, Currents(Water), Water levels, Winds, Waves(Water), Tides, Coasts, Data processing. Analytical techniques. Estuaries. processing, Analytical technique *Aransas Pass(TX), Tidal dynamics.

Current, water level and wind data collected from a study site at the Aransas Pass, Texas, during a 45-day period in mid-1977 were used to describe tidal motions and low-frequency, meteorologicallyday period in mid-1977 were used to describe tidal motions and low-frequency, meteorologically-forced exchanges between the inner shelf and a series of intracoastal bays. Analysis of individual tidal constituents indicated a mixed but principally diurnal tide. Tidal constituents moved through the Pass as nearly progressive waves. Asymmetry in the co-oscillating tidal motions was explained as a result of unequal frictional forces acting on flood and ebb currents in the Pass. Tidal excursions computed from the tidal harmonic constants and from cumulative net displacements suggested that tidal-period exchanges are not effective in flushing the bays even under tropic tidal conditions. Nontidal water levels were related to the cross-shelf dal water levels were related to the cross-shelf component of the coastal wind stress at statistically significant levels. This suggested that low-frequen-cy local meteorological forcing, as a set-up or setdown of coastal water levels, plays a valuable role in assisting tidally-driven exchanges. (Sims-ISWS) W80-03027

A THREE-YEAR STUDY OF BENTHOS OF MUDDY ENVIRONMENTS IN PORT PHILLIP BAY, VICTORIA,

BAY, VICTORIA, Victoria Ministry for Conservation, Melbourne (Australia). Marine Pollution Studies Group. G. C. B. Poore, and S. Rainer. Estuarine and Coastal Marine Science, Vol 9, No 4, p 477-497, October 1979. 8 Fig, 6 Tab, 35 Ref.

Descriptors: *Bays, *Benthos, *Biological communities, *Aquatic environment, *Australia, On-site investigations, Sediments, Marine biology, Aquatic life, Seasonal, Variability, Analytical techniques, Statistical methods, Data collections, Benthic fauna, Crustaceans, Foreign research, Foreign countries, Water quality, Water temperature, Salinity, Phosphorus, Nitrogen, *Port Phillip Bay, Polychaetes.

Samples taken four times a year over three years (1973-1975) at three widely separate stations in muddy environments in Port Phillip Bay were used to compare species diversity and composition of the benthic community between areas, seasons, and years. Analysis of variance of five community statistics, the number of individuals the number of and years. Analysis of variance of live community statistics: the number of individuals, the number of species, Shannon's diversity, and two evenness measures, showed that differences among the three stations and among years contributed the largest fractions of the variance in number of individuals and species but little to diversity or evenness. Seasonal differences contributed negligibly to vari-Seasonal differences controlled negligopy to variance in any statistic except diversity. Small scale spatial patchiness (from replicate samples within stations) contributed a significant fraction of variance to all five statistics. The fauna at all stations was dominated by the deposit-feeding bivalve Theora fragilis and the decapod shrimp Callianassa limoses only minor spacies were restricted to sincle limosa; only minor species were restricted to single stations. The density of few species varied season-ally, but several were more abundant in some years any, out several were more abundant in some years than others. Hierarchical classification using the Canberra metric dissimilarity coefficient grouped samples into station groups. Use of the Bray-Curtis coefficient grouped some samples by station and some by season, and it was concluded that the main differences between stations were in overall in the station of t species composition, not in the densities of domi-nant species. Temporal changes in community structure were nonseasonal but were irregular changes occurring at single stations. Differences in

Field 2—WATER CYCLE

Group 2L—Estuaries

fauna between stations were related in part to small differences in sediment-type but not to physico-chemical features of the overlying water. The irregular fluctuations in density of the common species and in the identity of the minor species suggest that multiple-stable points in community structure may exist for the silty-clay community. The two cies and in the identity of the minor species suggest that multiple-stable points in community structure may exist for the silty-clay community. The two major species seemed not to have altered each other's environment over the sampling period. Considerable variation in species composition may occur in soft-bottom benthos in the absence of marked environmental perturbations. (Humphreys-ISWS)
W80-03028

ZINC IN THE CONWY RIVER AND ESTUARY, Leeds Univ. (England). Dept. of Earth Sciences. H. Elderfield, A. Hepworth, P. N. Edwards, and

L. M. Holliday.
Estuarine and Coastal Marine Science, Vol 9, No
4, p 403-422, October 1979. 10 Fig, 4 Tab, 45 Ref.

Descriptors: *Estuaries, *Water pollution sources, *Zinc, *Diagenesis, Sediments, Iron, Manganese, Pollutants, Heavy metals, On-site investigations, Rivers, Spatial distribution, Data collections, Analytical techniques, Connate water, Water quality, Solubility, Sulfides, Estuarine environment, Foreign research, Foreign countries, *Wales, *Conwy River(Wales).

The objective of this research was to identify the important inorganic reactions which control the behavior of zinc supplied to waters of the Conwy River and Estuary in North Wales, a region free of heavy urban and industrial pollution, but subject to the effects of mineralization; this included an examination of the diagenesis of zinc in anoxic estuarine sediment. Several factors were identified which contribute to the geochemical balance of zinc in the Conwy River and Estuary. (1) Precipitation of iron and manganese which are mobilized in acid, reducing soils acts to remove dissolved zinc from reducing soils acts to remove classified the first in the river of zinc associated with hydrous iron and manganese oxides. (2) There is no large-scale removal of dissolved zinc during the mixing of river water and sea water in the estuary. (3) Zinc is precipitated with iron as an insoluble sulphide in anoxic estuarine sediments. (4) Because of diagenetic remobilization processes, the surface layer of estuarine sediments is enriched in iron and manga-nese, and, to a lesser extent, zinc. Resuspension of this layer may promote the formation of zinc-rich particles in bottom waters of the estuary. Further work is required in estuaries where two-end-member mixing can be demonstrated in order to provide more precise information as to whether removal of zinc and other heavy metals can occur removal of zime and other leaves in the floculation of dissolved iron at low salinities. In addition, more comprehensive and mechanistically-oriented studies are urgently needed on the distribution of dissolved metals in pore waters of sulphide-rich sediments. (Humphreys-ISWS) W80-03029

A VARIABLE-DEPTH GREEN'S FUNCTION FOR SHELF EDGE TIDES, Dalhousie Univ., Halifax (Nova Scotia). Dept. of

Oceanography.
C. Garrett, and B. Toulany.

UMI

Journal of Physical Oceanography, Vol 9, No 6, p 1258-1272, November 1979. 15 Fig. 1 Tab, 10 Ref.

Descriptors: *Tides, *Continental shelf, *Model studies, Mathematical models, Theoretical analysis, Oceans, Coasts, Gulfs, Equations, Mathematics, Oceanography, *Gulf of Maine, *Bay of Fundy.

The Green's function for a semi-infinite ocean with The Green's function for a semi-infinite ocean with depth a function of distance from the boundary was developed numerically for the M sub 2 frequency and with Coriolis frequency and depth profile appropriate to the continental slope off the Gulf of Maine. This involved numerical integration of the linearized shallow water equations for all longshore wave numbers, followed by numerical Fourier transformation. This variable-depth Green's function is approximately equal to Buchwald's constant-depth Green's function for dis-

tances along the boundary greater than the width tances along the boundary greater than the width of the slope, and at very short range tends to limiting values which can be approximated analytically. The Green's function, when combined with currents from Greenberg's numerical model of the Bay of Fundy and Gulf of Maine, was used to explain substantial observed variations in M sub 2 amplitude and phase along the edge of the shelf off the Gulf of Maine; the variable-depth Green's function produced significantly better results than the Gulf of Maine; the variable-depth Green's function produced significantly better results than the constant-depth Green's function. The results supported the basic premise that the M sub 2 elevation at the shelf edge in the absence of the Gulf of Maine would be fairly constant, and suggested ways of deriving open boundary input for tidal models of coastal seas with a minimum of offshore gaging. (Sims-ISWS)

THEORETICAL AND EXPERIMENTAL STUDY OF WIND- AND WAVE-INDUCED

Shell Development Co., Houston, TX. For primary bibliographic entry see Field 5B. W80-03031

AN APPROACH FOR HYDRODYNAMIC MODELING OF MAINE'S ESTUARIES. Maine Univ. at Orono. Dept. of Civil Engineering.

R. B. Fidler.

R. B. Fidler.

Available from the National Technical Information Service, Springfield, VA 22161 as PB80-139595, Price codes: A05 in paper copy, A01 in microfiche. MS thesis August 1979. 85 p, 23 Fig, 1 Tab, 27 Ref, OWRT A-047-ME(2).

Descriptors: *Maine, *Mathematical models, *Estuaries, *Water pollution, *Hydrodynamics, Computer models, Water circulation, Currents(Water), Hydraulics, Movement, Tides, Winds, Hydrologic

A hydrodynamic study of the Upper Penobscot Bay in Maine was conducted using a three dimensional finite difference model. Penobscot Bay is a major commercial, industrial, and fishing center for the state. Models for water and waste movement are needed due to the rapid industrial growth along Maine's coast and the subsequent water pollution problems. Maine currently has no site suitability classification waters for its coastal are. The lution problems. Maine currently has no site suitability classification system for its coastal area. The model used here, GAL (for Galerkin) was implemented on the University of Maine IBM 370 System and to supplement printed output, pictoral representations of calculations current velocities are provided. The numerical model is widely applicable and reasonably inexpensive. Several prior hydrographic studies of the Bay were used to provide model data. Five sets of data are needed for the model: (1) bathymetry, (2) tidal, (3) river flow, (4) wind, and (5) current characteristics data. The Navier-Stokes countions and the continuity flow, (4) wind, and (3) current characteristics data. The Navier-Stokes equations and the continuity equations are used to describe processes causing water motion. A summary of GAL's mathematical and numerical development is given. Thirteen simulations were run providing successful significant information. A comparison of model results and actual field data show some success of describing Bay hydrodynamics. (Seigler-IPA) W80-03084

COMPUTER SIMULATION OF STORM SURGES AND RIVER FLOODING IN MOBILE BAY, Alabama Univ., University. Dept. of Chemical En-

gineering. G. C. April, and S. Hu.

G. C. April, and S. Hu.
Available from the National Technical Information
Service, Springfield, VA 22161 as PB80-138514.
Price codes: A07 in paper copy, A01 in microfiche.
Bureau of Engineering Research Report No 232112, March 1979. 138 p. 36 Fig, 13 Tab, 26 Ref, 3
Append. OWRT A-061-ALA(2).

Descriptors: "Model studies, "Computer models, "Hurricanes, "Surges, "Flood forecasting, Alabama, Gulf of Mexico, Tides, Salinity, Saline water, Winds, Hydrodynamics, Bays, Estuaries, River basins, Mobile River, Mobile Bay.

A modified Reid-Bodine hydrodynamic-salinity model and an open coast water model were used on the University of Alabama Univac-1110 com-puter system to simulate the Mobile Bay, Alabama, system under severe storm surge and/or flooding conditions. Mobile Bay with an area of 1036 sq km is located east of the Mississippi River delta on the north-eastern shore of the Gulf of Mexico. It is the terminus of the Mobile River basin and is the fourth largest drainage area in the U.S. The Bay is 50 km long and from 13 to 38 km wide. Historical-30 km iong and from 15 to 3 km wide. Historical-ty hurricanes have caused much destruction in the area with 55 hurricanes affecting Alabama from 1711 through 1972. Hurricanes cause both surges in the bay and river flooding. Data input and sources are described including river flooding input data and storm surge input data with conformal mapping and storm surge equations. Model calibration and verification are also described. The calibration and verification are also described. The model is used to describe water behavior during river flood stage as a function of river discharge rate. Results show that during river flood stage, Bay water properties are dominated by fresh river water. However, during storm surge conditions large amounts of saline water enter the Bay. The model is used to calculate water elevation, veloc-tive of salistics are some controlled. ity, and salinity as a storm approaches. Comparison of model results with field data show reasonable accuracy. (Seigler-IPA)

IMPACT OF DELTA OUTFLOW UPON SALINITY AND WATERFOWL IN THE SUISUN MARSH.

Bureau of Reclamation, Washington, DC. M. C. Rumboltz.

November 1979. 206 p, 161 Fig, 14 Tab, 1 Append.

Descriptors: *Saline water, *Wildlife habitats, *Ducks(Wild), *Model studies, Bays, California, Estuarine environment, Brackish water, Waterfowl, Water birds, Green-winged teal, Mallard duck, Shoveler duck, American widgeon, Tidal waters, Suisun Marsh.

Historical salinity levels in the Suisun Marsh and freshwater outflow from the Sacramento-San Joaquin Delta were studied and a Delta outflow model and salinity equations were developed to test management alternatives and to predict future salinities. The Suisun Marsh, located in the San sammtes. The suisun Marsh, tocated in the San Francisco Bay Estuary, is a wintering area or home for 200 species of birds, 45 species of mam-mals, and 36 species of reptiles. Birds wintering in the Marsh include the pintail duck, the American wigeon, mallards, shovelers, and green-winged teals. The Marsh is brackish with salinity levels ranging from 50 micromhos to 27,600 micromhos with 4,700 to 18,000 micromhos suggested as optimum for promoting waterfowl food plants. Low salinity levels occur during winter and spring when Delta outflow is high with high salinity levels occurring in summer and fall when outflow is low. Salinity/outflow equations were developed and verified to predict mean monthly salinity. The equations were used to join Delta outflow to the Marsh salinity model. Results from the use of the model indicate that in February through May Delta outflow will not be sufficient to provide optimum salinity. Various management alternatives to maintain optimum salinity levels include tide gates, waste water reuse, freshwater release, and rerouting of sloughs. Although salinity levels may be improved in the future to produce more food for ducks, duck populations may not increase. Extensive data plots are included. (Seigler-IPA) W80-03099

ATP AS A MEASURE OF LIVING PHYTO-PLANKTON CARBON IN ESTUARIES,

Quebec Univ., Rimouski. Dept. of Oceanography. For primary bibliographic entry see Field 5C.

Conservation In Agriculture—Group 3F

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

SOLAR ENERGY COLLECTORS AND PLANTS OPERATED BY THEM,

N. Laing, I. Laing, and O. Laing. U.S. Patent No 4,172,766, 20 p. 14 Fig. 15 Ref; Official Gazette of the United States Patent Office, Vol 987, No 5, p 1205, October 30, 1979.

Descriptors: *Patents, *Desalination, *Solar radiation, Water purification, Sea water, Energy conversion, Electric power production, Desalination

The object of the invention is to provide a solar collector which is designed to float on water or air and which comprises elastic elements not subject to bending stresses within the range of their application. Water surfaces offer favourable conditi for collectors intended to be spread over a flat surface. Collectors comprise several flexible layers of which the lowest is an insulating layer, the layer above it conducts a heat carrier and the top layer serves to prevent convection losses. These layers can be prefabricated in the form of elements of large surface area. They are assembled by joining a large number of identical elements into a complete floating platform which in turn, is surrounded by peripheral elements so designed as to make a radial prestretching of the solar collector elements possible. A preferred field of application is electricity generation. In this application, a fluid heat carrier is pumped through ducts in the heat carrier conducting layer. The head so extracted heats of a quantity of stored water in a foil container im-mersed in the water. The heat may serve for feeding a turbine. If sea water is evaporated then the condensate can be extracted as fresh water. However the plant may also be so designed that it is entirely deployed for sea water distillation. In this case, the heat of condensation is drawn on for repeated distillation in further stages. (Sinha -W80-03225

WATER PURIFICATION SYSTEM.

W. E. Sear.

U.S. Patent No. 4,172,767, 6 p, 4 Fig, 12 Ref; Official Gazette of the United States Patent Office, Vol 987, NO 5, p 1205, October 30, 1979.

Descriptors: *Patents, *Water treatment, *Desalination, Water purification, Sea water, Solar radiation, Condensation, Desalination equipment,

The concept of the invention involves the provision of a system comprising a tank into which sea water or impotable water normally flows or settles. The top of this tank is covered by a plastic cover which is able to accomodate and pass the heating rays of the sun. Thesun's rays passing through this plastic cover causes the water captured within the tank portion to vaporize. As a result, the water within the tank becomes vaporized within the upper portion of the cover and above the sea water in the form of moisture-laden air. This moisture-laden air is then conveyed by a blower arrangement into a pipe line of any suitable material. The water condensrs as it passes through the line from an area of one temperature to an area of another and lower temperature. A fluid pump is provided in the line to pump the pure water into a fresh water storage tank where it can be stored pending transportation to the source using the fresh water. The entire unit may be supported in a float arrangement where some parts are suspended above the sea level while others are anchored below the sea. (Sinha-OEIS) W80-03264

3C. Use Of Water Of Impaired

SEWAGE EFFLUENT AND LIQUID DIGEST-ED SLUDGE AS AIDS TO REVEGETATION OF STRIP MINE SPOIL AND ANTHRACITE COAL REFUSE BANKS, Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources. L. T. Kardos, W. E. Sopper, B. R. Edgerton, and L. E. DiLissio.

L. E. DiLISSIO.
In: Utilization of Municipal Sewage Effluent and Sludge on Forest and Disturbed Land, p 315-331, 1979. 14 Fig. 15 Tab, 18 Ref. OWRT B-047-PA(10), B-069-PA(6).

Descriptors: *Sewage effluents, *Sludge disposal, *Coal mine wastes, *Vegetation establishment, Revegetation, Legumes, Grasses, Trees, Leachate, Soil chemistry, Acidic soils, Strip mines, Spoil banks, Chemical analysis, Lysimeters.

Sewage effluent and liquid digested sludge were used as ameliorating agents for revegetation of bituminous strip mine spoil and anthracite refuse in Pennsylvania. Revegetation of such areas is hampered by excessive acidity with high levels of iron, aluminum, and manganese; plant nutrient deficiency; drought; and lethally high surface temperatures. Plants used for revegetation included eight reass spocies, eight legume species, and eight tree grass species, eight legume species, and eight ucspecies. Experimental treatment boxes contained
25 tons of spoil or refuse over a 6 inch layer of
quartz sand resting on Hublersburg silt loam.
Three lysimeters were used in each box to sample
percolate water. Effluent and/or liquid sludge
were applied at weekly intervals in amounts ranging from 0 to 5 cm. Weekly samples of effluent,
iquid sludge, and leachate were analyzed for pH,
total acidity, sulfates, nitrate N, organic N, ammonium N, orthophosphate P, total P, potassium,
calcium, magnesium, manganese, iron, copper,
boron, aluminum, zinc, and sodium. Results show
that sewage effluent and/or liquid digested sludge
will detoxify both spoil and refuse and promote the
establishment of a vegetative cover that will persist. Greater growth after establishment can be grass species, eight legume species, and eight tree species. Experimental treatment boxes contained establishment of a vegetative cover that will per-sist. Greater growth after establishment can be obtained by periodic effluent or sludge applica-tions. None of the legumes were found to be as productive as the grasses, and tree seedling surviv-al rates were improved by the treatments. (See also W80-03089) (Seigler-IPA) W80-03093

3D. Conservation In Domestic and Municipal Use

WATER REQUIREMENTS FOR URBAN

LAWNS,
Arizona Univ., Tucson. Dept. of Plant Science.
W. R. Kneebone, I. L. Pepper, R. E. Danielson,
W. E. Hart, and L. O. Pochop.
Available from the National Technical Information

Available from the National Technical Information Service, Springfield, VA 22161 as PB80-140080, Price codes: A10 in paper copy, A01 in microfiche. Water Resources Research Institute Wyoning University, Laramie, Project Completion Report, September 1979. 217 p. 24 Fig. 67 Tab, 18 Ref, 9 App. OWRT B-035-WYO(6), 14-34-0001-7201.

Descriptors: *Water requirements, *Sprinkler irrigation, *Lawns, *Turf grasses, Lysimeters, Arizona, Colorado, Wyoming, *Urban lawns.

Water requirements and application rates of urban lawns were studied in a 3-state (Arizona, Colorado and Wyoming) area. The study measured the water use of Kentucky bluegrass in Colorado and Wyoming, and of different bermudagrass cultivars, zoysia, St. Augustine grass and tall fescue in Arizona. The overall objective of the study was to batain measured data concerning water use of urban lawns. This was accomplished by: (1) determining water requirements by use of lysingters. (2) uroan lawns. Ins was accomplished oy; (1) deter-mining water requirements by use of lysimeters, (2) monitoring actual water application rates by home-owners, and (3) testing common sprinklers to de-termine their distribution patterns. A wide range of conditions were represented by the project. As indicated, Arizona worked with warm-season

grasses, while Colorado and Wyoming worked with bluegrass. This, plus the fact that the study sites represent a wide north-south segment of the region, should make the results widely applicable. To make the findings further applicable they were prepared in the form of lawn watering guidelines that can be used by water managers.

3F. Conservation In Agriculture

EFFICIENCY IN THE USE OF WATER FOR IRRIGATION: THE ROLE OF PRICES AND REGULATIONS, United Nations Centre for Natural Resources, Energy and Transport, NY. H. M. Neghasi, and J. A. Seagraves. Natural Resources Forum, Vol 3, No 4, p 53-72, 1978. 1 Fig. 6 Tab, 19 Ref.

Descriptors: *Water distribution(Applied), *Water Descriptors: "Water distribution(Applied), "Water allocation(Policy), "Irrigation programs, "Pricing, "Regulation, "Irrigation efficiency, Water conservation, Water management(Applied), Mexico, Economics, Water rates, Economic efficiency, Administrative agencies, Water policy, Low flow, Irrigation districts, Irrigation practices, Irrigation practices, Irrigation water. Agriculture

Although engineering and agronomic constraints usually define the degree of efficiency necessary for use of irrigation water in any setting, artificial pricing and governmental regulation can both support improvements in equitable and efficient water port improvements in equitative and case stud-ies, the paper discusses physical and economic irrigation efficiencies and their interrelationships; the cale of pricing and regulations is emphasized irrigation emiciencies and regulations is emphasized and general guidelines are explored for use of fixed-rate and volumetric rate pricing structures. Factors considered include: (1) value and resource Factors considered include: (1) value and resource combinations which relate to physical and economic efficiency in water use; (2) factors affecting prices and regulations for irrigation waters; (3) factors affecting prices and regulations for irrigation water; (4) pricing of irrigation water and alternative systems of delivering it to farms; and (5) water laws and ownership. A case study of irrigation water pricing in Mexico demonstrates that charges hased on water volume or the number of charges based on water volume or the number of irrigation events makes farmers more careful in irrigation evenis makes tamers more careful in their use of water, thus contributing to application efficiency, whereas flat rate charges per hectare or per season give no incentive to conserve water. Institutional arrangements for managing water from irrigation canals are affected by the extent to which flow can be regulated by such means as a reservoir. Since volumetric measurements are costly, they are recommended only when the value of water is high enough and the flow can be regulated. When flows are uncertain shares of the water rather than specific volumes should be allo-cated to individual farms. (Harris-Wisconsin) W80-03140

LINEAR MOVE IRRIGATION SYSTEM AND CONTROL THEREFOR, Valmont Industries, Inc., Valley, NE. (Assignee). T. M. Johnson.

U.S. Patent No 4,172,551, 15 p, 17 Fig, 5 Ref; Official Gazette of the United States Patent Office, Vol 987, No 5, p 1134, October 30, 1979.

Descriptors: *Patents, *Irrigation systems, *Control systems, Automatic control, Irrigation practices, Irrigation efficiency, Irrigation operation and

A linear move irrigation system and control for use in irrigating large land areas includes a water conduit extending over a portion of the field supported on a series of support towers. The entire conduit is made to move down the field to be irrigated. A control system controls the movement of the irricontrol system controls the movement of the irri-gation system along a defined path and maintains the wheel tracks of the conduit support towers generally parallel to the path. The control system includes a sensor located somewhere along the water conduit for sensing when a point located forward of the conduit relative to its direction of

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation In Agriculture

travel, is off the defined path. The movement of outwardly located towers near opposite ends of the conduit are automatically controlled in response to the path. The towers are preferably located at opposite ends of the conduit, so as to maintain the point over the defined path, and further to maintain the wheel tracks of the conduit support towers generally parallel as the system moves over the field. The controlled towers near opposite ends of the conduit are normally driven when the point is on the path. (Sinha-OEIS)

W80-03196

SELF-PROPELLED LINEAR IRRIGATION

SELF-PROPELLED STYSTEM, N. S. Standal.
U.S. Patent No 4,172,556, 14 p. 16 Fig. 10 Ref. Official Gazette of the United States Patent Office, Vol 987, No 5, p 1136, October 30, 1979.

Descriptors: *Patents, *Irrigation, *Irrigation sys-tems, *Application equipment, Irrigation practices, Irrigation efficiency, Irrigation operation and maintenance, Self-propelled pneumatic systems.

A self-propelled linear irrigation system including an elongated line move having sprinkler outlets along its length, mobile supports spaced along the line move and a main tractor having a water pipe outlet engaging member and a fluid powered prime mover is disclosed. The propulsion system comprises a pneumatic system involving a main compressed air line and compressed air storage tank on the main tractor and each mobile support. The tractor of the irrigation system has automatic cou-pling members for coupling to the water supply pling members for coupling to the water supply and compressed air supply and automatically pro-pels itself from one compressed air and water station to the next compressed air and water sta-tion along a main supply line. The main tractor has a main rigid central section having connecting members for connecting the tractor with the elon-gated line move and a first and second valve car, each having extensible propulsion members con-necting each valve car to the main section. The tractor also has a drift correction system to main-tain the tractor and line move traveling along a straight course, parallel to the main water supply line. (Sinha-OEIS)
W80-03197

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

URBAN STORMWATER CONTROL PACKAGE FOR AUTOMATED REAL-TIME SYSTEMS. Colorado State Univ., Fort Collins. Dept. of Civil

Colorado State Univ., FOIT Colinis. Dept. of Civil Engineering.
J. W. Labadie, D. M. Morrow, and R. C. Lazaro.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-139785, Price codes: All in paper copy, A01 in microfiche. Completion Report, December 1978. 234 p, 47 Fig. 22 Tab. 12 Ref, 5 Append. OWRT-C-6174 (52)18/31) (5218)(3)

Descriptors: *Urban runoff, *Automatic control, *Computer models, *Storm runoff, Storm drains, Interceptor sewers, Storm water, Urban drainage, Combined sewers, Storage requirements, Water pollution sources, Numerical analysis, California, Runoff forecasting, Timing.

UMI

A methodology is presented for automatic computer control of in-line sewer storage as a cost-effective means of limiting water pollution for storm and combined sewer overflows. The methodology called a Stormwater Control Package (SWCP) in the storage to the sewer storage to the storage computer models for inflow forecasting, sewer routing, and operational storage control for real-time simulated environments. Controllable in-line storage uses adjustable weirs, valves, or gates in interceptors,

laterals, or outfalls to create backwater that is stored to prevent an overflow of untreated stormwater. Because rapid response is needed to deal with the complex flow characteristics occurring during a storm, automated computer control is needed. Fully automated control requires three systems: intelligence, central processing, and regulators. SWCP uses an autoregressive transfer-function type forecasting model and can be used as a tool to design and test automatic control systems. SWCP's control algorithm is described with a unique method for integrating unsteady flow and optimal control. The control package is applied to San Francisco's Marina Branch of the North Shore Outfalls Consolidation Project to demonstrate San Francisco sa marina branch of the rotter shorter fourfalls Consolidation Project to demonstrate SWCP's potential usefulness. Results are presented along with reactive and adaptive control policies with an analysis of performance of control strategies. (Seigler-IPA) W80-03080

DRAINAGE ATLAS: BROWN PUBLIC PUBLIC DRAINAGE ATLAS: BROWN COUNTY, MINNESOTA, Mankato State Univ., MN. Dept. of Biology. L. Dunsmore, R. W. Oelerich, and H. W. Quade. Limnological Contribution No 10, June 1979. 57 p, 69 Fig, 36 Tab. OWRT A-040-MINN(4).

Descriptors: *Drainage, *Ditches, *Minnesota Descriptors: "Drainage, "Difficies, "Mannesota, "Mapping, Hydrology, Computer models, Watersheds(Basins), Land use, Agricultural engineering, Drainage engineering, Geomorphology, Distribution patterns, Hydrography, Terrain analysis, River basins, Drainage systems.

sis, River basins, Drainage systems.

Drainage data maps and tables are presented for Brown County in south central Minnesota. The data are to be used for the development of a computer modeling system of drainage effects. Drainage system features include ditches and riversheds. The planned computer modeling will aid planning for lake restoration, new ditch construction, and water resources development. An inventory of all county ditches is provided including ditch number, location, year established, length, area drained, tributary to, and rivershed. For consistency and ease of comparison, the Minnesota Land Management Information System (MLMIS) format is used. This format is also consistent with the United States land survey system. The county is divided into 40 acre townships which are subdivided in 36 sections made of 16 fourth acre parcels. For each of the 20 townships, data for four MLMIS variables are presented: land use, water orientation, soil landscape, and geomorphic regions. General land survey maps and present surface hydrology maps are also presented for each township as well as for the whole county. An overall Brown County ditch map shows ditches by decade of establishment and type (open or tiled). (Seigler-IPA) (Seigler-IPA) W80-03095

PUBLIC DRAINAGE ATLAS: NICOLLET COUNTY, MINNESOTA, Mankato State Univ., MN. Dept. of Biology. L. Dunsmore, and H. W. Quade. Limnological Contribution No 8, June 1979. 61 p, 82 Fig. 30 Tab. OWRT A-040-MINN(5).

Descriptors: *Drainage, *Ditches, *Minnesota, *Mapping, Hydrology, Computer models, Watersheds(Basins), Land use, Agricultural engi-neering, Drainage engineering, Geomorphology, Distribution patterns, Hydrography, Terrain analy-sis, River basins, Drainage systems.

Tables and maps of drainage data are presented for Nicollet County located in south central Minneso-ta. Drainage data primarily consist of ditches and riversheds since ditches are of agricultural impor-tance in the area. Data are being collected for the ultimate development of a computer modeling technique for drainage effects. The model will be used for planning involving new drainage ditches, lake restoration, and other water resources development. An inventory of all county ditches is presented including ditch number, location, year established, length, area drained, tributary to, and rivershed. Data are presented according to the Minnesota Land Management Information System

(MLMIS) format because it is consistent with the United States land survey system and because much data were taken from MLMIS. The system divides the county into 40 acre townships which are subdivided into 36 sections made of 16 fourth acre parcels. Data are presented for each of the county's 22 townships including general survey maps, present surface hydrology maps, land use tables, water orientation tables, soil landscape tables, and geomorphic regions tables. An overall Nicollet County ditch map is also presented along with overall maps for land use, water orientation, soil landscape, and geomorphic regions. (Seigler-IPA) IPA) W80-03096

PUBLIC DRAINAGE ATLAS: LESUEUR COUNTY, MINNESOTA, Mankato State Univ., MN. Dept. of Biology. L. Dunsmore, and H. W. Quade. Limnological Contribution No 7, May 1979. 51 p, 59 Fig. 33 Tab. OWRT A-040-MINN(3).

Descriptors: *Drainage, *Ditches, Descriptors: Planinge, Juninesota, "Mapping, Hydrology, Computer models, Watersheds(Basins), Land use, Agricultural engineering, Drainage engineering, Geomorphology, Distribution patterns, Hydrography, Terrain analysis, River basins, Drainage systems.

Drainage data are presented in the form of maps and tables for LeSueur County in south central Minnesota. Data are being collected for the ultimate development of computer modeling of drainage effects. Due to agricultural needs, drainage in the county is mostly in the form of ditches. The planned computer modeling will aid in planning for water resources development, lake restoration, and proposed new drainage ditches. An inventory of all county ditches is presented including ditch number, location, year established, length, area drained, tributary to, and rivershed. The Minnesota Land Management Information System (MLMIS) format is used because it is consistent with the United States land survey system and because much data were obtained from the system. The county is divided into townships each subdibecause much data were obtained from the system. The county is divided into townships each subdivided into 36 sections made of 16 fourth acre parcels. General land survey maps and present surface hydrology maps are presented for each of the county's 17 townships. Also provided are data on land use, water orientation, soil landscape, and geomorphic regions. Drainage data are also provided by rivershed. (Seigler-IPA) W80-03097

ASSESSING IMPACTS OF LAND MANAGEMENT ACTIVITIES ON EROSION-RELATED NONPOINT SOURCE PROBLEMS, Oregon State Dept. of Environmental Quality, Portland.

For primary bibliographic entry see Field 5B. W80-03113

THE EFFECTS OF THE FOOD PREFERENCES AND STOCKING RATES OF GRASS CARP (CTENOPHARYNGODON IDELLA VAL.) ON MIXED PLANT COMMUNITIES, Agricultural Research Council, Kidlington (England). Weed Research Organization. M. C. Fowler, and T. O. Robson. Aquatic Botany, Vol 5, No 3, p 261-276, 1978. 5 Fig, 5 Tab, 22 Ref.

Descriptors: *Aquatic weed control, *Grass carp, *Biocontrol, *Food habits, Algal control, Chara, Potamogeton pectinatus, Fish behavior, Predation, Fish stocking, Forage palatability, Elodea canadensis, Myriophyllum spicatum L., Potamogeton natans L., Ecology, Prey fish, Algae, Aquatic weeds, Browse utilization, England.

Results of two years of studies of the effect of grass carp grazing preferences in a mixed-plant aquatic weed community are reported. In a series of pond experiments conducted in Great Britain to replicate similar studies in other countries, small (10-30 g) grass carp (Ctenopharyngodon idella Val.) selectively grazed submerged weeds. In all the experiments, the carp ate their favorite species

WATER QUANTITY MANAGEMENT AND CONTROL—Field 4

Effects On Water Of Man's Non-Water Activities—Group 4C

first, i.e. Charasp., Potamogeton pectinatus and Elodea canadensis, and ignored the less-palatable Myriophyllum spicatum L. and P. natans L. Originally the total plant biomass was reduced as the palatable plants were grazed; however, the avoided species spread and eventually total biomass was similar to that in ungrazed pools. Some of the heavily grazed plants (P. pectinatus and Chara sp.) re-established themselves when the fish were removed. Only after a prolonged period without food did the fish begin grazing unpalatable plants. Similar results were obtained in ponds with bigger fish (200-400 g). These feeding behavioral experisable themselves after the introduction of fish for aquatic weed control purposes, especially at higher stocking rates; but these results are brought about only by the fish quickly eating the more-pallatable plants. For weed control purposes, the proportion only by the fish quickly eating the more-palistable plants. For weed control purposes, the proportion of palatable to unpalatable plants in a weed community will determine the stocking rate needed to show rapid control of weeds. Generally, understocking should be avoided unless other measures are added to control the less-palatable plants. (Harris-Wisconsin) W80-03121

HYDROLOGIC CONSIDERATIONS IN DECISION ANALYSES FOR RECLAIMING STRIP MINE LAND IN THE SOUTHWEST, Arizona Univ., Tucson. Dept. of Watershed Man-

Arizona Univ., Tucson. Dept. of Watershed Management.

J. Thames, and T. Verma.

Available from the National Technical Information
Service, Springfield, VA 22161 as PB80-140130,
Price codes: A02 in paper copy, A01 in microfiche.
Water Resources Research Center, University of
Arizona, Project Completion Report, January
1980, 13 p., 2 Fig. 19 Ref. OWRT B-055-ARIZ(3),
14-34-0001-7139.

Descriptors: *Land reclamation, *Strip mines, *Land management, *Erosion control, Surface runoff, Flow control, Water pollution control, Planning, Surface mining control.

A multiattribute utility function is used to model preferences on outcomes of alternative reclamation schemes for stripmined lands, using Arizona and Wyoming examples. Each scheme should at least help restore land to its premining value, and is composed of three sets of actions: mining operations, preparations for postmining land use, and mitigating actions. Grazing and runoff augmentation are examples of postmining land use goals, and mitigating actions may be measures to protect the environment like pollution control in runoff or infiltration. Conflicting objectives are involved, including the maintenance of sufficient coal production, the alleviation of detrimental environmental effects, and the minimization of loss. Since the A multiattribute utility function is used to model tion, the alleviation of detrimental environmental effects, and the minimization of loss. Since the environmental effects are fraught with uncertainty, a multiobjective decision-making scheme under uncertainty is set up to analyze the problem. The decision model ranks alternative reclamation schemes on the basis of the preference function of a group decision maker, each member of which assessing a separate subset of single attribute utility functions W80-03176

SOIL SEDIMENT DEPOSITS IN SUBSURFACE DRAINS.

Science and Education Administration, Brawley, CA. Imperial Valley Conservation Research

L. B. Grass, L. S. Willardson, and R. A. LeMert. Transactions of the American Society of Agricultural Engineers, Vol 22, No 5, p 1054-1057, September-October 1979. 6 Fig, 2 Tab, 17 Ref.

Descriptors: *Tile drains, *Subsurface drains, *Sediments, *Clogging, *California, Deposition(Sediments), Drains, Drainage, Drainage, practices, Tiles, Soils, Soil water, Irrigation, Salinity, On-site investigations, Agriculture

The possible mode of sediment entry into drains may be determined by comparing the particle-size distribution curves of the deposits with those of corresponding soils. Some deposits will be finer,

some similar, and some coarser in texture than the some similar, and some coarser in texture than the soil. Variations in texture are due to a sorting process effected by the envelope, by reductions in water-flow velocity, by breaks or loose joints in the drain pipe, or by the effluents washing the fine sediments out of the drain. The dispersive effect of a high sodium content can also influence the texture of the deposit. (Sims-ISWS)

A MODEL FOR EVALUATING RUNOFF-QUALITY IN METROPOLITAN MASTER PLANNING,

Water Resources Engineers Inc., Walnut Creek, CA.

For primary bibliographic entry see Field 5B. W80-03199

DESIGN OF FLOOD CONTROL IMPROVE-MENTS BY SYSTEMS ANALYSIS: A CASE STUDY.

Hydrologic Engineering Center, Davis, CA. For primary bibliographic entry see Field 2E. W80-03203

4B. Groundwater Management

CONNECTOR WELLS, A MECHANISM FOR WATER MANAGEMENT IN THE CENTRAL FLORIDA PHOSPHATE DISTRICT, LaMoreaux (P. E.) and Associates, Inc., Tusca-

loosa, AL. P. E. LaMoreaux.

Journal of Hydrology, Vol 43, No 1/4, p 469-490, October 1979. 8 Fig. 4 Tab, 24 Ref.

Descriptors: *Recharge wells, *Florida, *Water management(Applied), *Siphons, *Groundwater recharge, Injection wells, Potentiometric level, Water table aquifers, Aquifer testing, Hydraulic properties, Pumping, Water wells, Aquifers, Phosphates, Percolation, *Floridan aquifer, Connector wells, Siphon wells, Gravity flow. wells, Siphon wells, Gravity flo

Connector wells, a mechanism for water management in the Central Florida Phosphate District, have proven to be an effective means of moving good quality groundwater from one formation downward to another under gravity flow; there results beneficial recharge to the underlying Floridan Aquifer and a solution to a dewatering prob-lem that enhances the mining of the phosphate ore. tem that enhances the mining of the phosphate ore.

Three unique recharge systems have been developed in the phosphate district of Florida that include recharge through connector wells by gravity flow of water from the overburden sand aquifer to the Floridan Aquifer, a system of siphon wells recharging water from the overburden to the underlying Floridan Aquifer by connector wells. The uerlying Floridan Adulter by connector wens. Ine siphon well recharging system has also been used effectively to relieve head or hydrostatic pressures built up in dams and dikes. (Visocky-ISWS) W80-03041

PROBLEMS OF LARGE-SCALE GROUND-WATER DEVELOPMENT, Hebrew Univ., Jerusalem (Israel). Center for Groundwater Research.

Journal of Hydrology, Vol 43, No 1/4, p 439-443, October 1979, 3 Ref.

Descriptors: *Groundwater, *Water resources, *Planning, *Water management(Applied), Water resources development, Water supply development, Wells, Water wells, Technology, Social aspects, Legal aspects, Water supply, Groundwater mining, Technical factors.

The difficulties encountered in the planned devel-The difficulties encountered in the planned development of groundwater resources were analyzed by comparing typical 'scripts' for surface and groundwater resources, respectively. The suggest-defended were: (1) campaigns of systematic field investigations in any area where the intensive exploitation of groundwater is envisaged; (2) standardization and codification of modern research techniques so that they can more readily be used

by any investigator; (3) the construction of water supply networks serving more than one user in order to stimulate cooperation and mutual control among water users and to facilitate the centralized regulation ISWS) W80-03043 ulation of groundwater abstraction. (Sims-

WATER BUDGET AND HYDRAULIC ASPECTS OF ARTIFICIAL RECHARGE, SOUTH COAST OF PUERTO RICO.

Geological Survey, Fort Buchanan, PR. Water Resources Div.

Resources Div.

J. E. Heisel, and J. R. Gonzales.

Geological Survey Water-Resources Investigations
78-58, May 1979. 102 p, 44 Fig, 17 Tab, 12 Ref.

Descriptors: *Aquifer management, *Groundwater recharge, *Model studies, *Artificial recharge, *Puerto Rico, Injection wells, Irrigation water, Infiltration, Water levels, Water quality, Evaluation, Analog models, *South-coastal Puerto Rico.

An analog model was used to evaluate ground-water conditions on the south coast of Puerto Rico. Water levels during a normal period and during an extended drought were simulated. Re-charge and discharge values are reported. The model was also used to evaluate the possibilities of using treated waste water to recharge the aquifer. Three methods were considered: infiltration basins, injection, and irrigation. The tests were planned to determine what changes in water levels would determine what changes in water levels would result if certain rates of application were used. Because of the limited vertical hydraulic conduc-tivity, irrigation is suggested as the most practical method of waste-water use. (Woodard-USGS) W80-03160

4C. Effects On Water Of Man's Non-Water Activities

EFFECTS OF GRAZING ON RUNOFF AND SEDIMENT YIELD FROM DESERT RANGE-LAND AT BADGER WASH IN WESTERN COLORADO, 1953-73, Geological Survey, Lakewood, CO. Water Resources Div.

G. C. Lusby. Available from Supt. of Documents, GPO, Washington, DC 20402, Price, \$2.50. Geological Survey Water-Supply Paper 1532-I, 1979. 134 p, 10 Fig, 1 Plate, 11 Tab, 9 Ref.

Descriptors: *Grazing, *Effects, *Runoff, *Sediment yield, *Range management, Evaluation, Sheet erosion, Storm runoff, Rainfall-runoff relationships, Soil types, Arid lands, Colorado, Utah, *Badger Wash(CO), Desert rangeland, Cattle grazing, Sheep grazing, Grazing rotation.

Four different systems of livestock management Four different systems of livestock management were compared hydrologically during a 20-year study (1953-73) in western Colorado. These systems were (1) grazing by cattle and sheep from November 15 to May 15 each year, (2) complete elimination of grazing, (3) grazing by sheep from November 15 to February 15 each year, and (4) grazing by sheep from November 15 to February 15 every other year. Grazing by both cattle and sheep from November 15 to May 15 each year was the standard grazing practice in the area at the beginning of the study. Complete grazing exclusion resulted in a reduction in runoff of about 20 percent during the period 1953-65 and an additional 20 resulted in a reduction in runoff of about 20 percent during the period 1933-65 and an additional 20 percent during 1966-73. During the same periods sediment yield was reduced by 35 and 28 percent, respectively, for a total of 63 percent. A change in grazing use from cattle and sheep, November 15-May 15 each year, to sheep only at approximately the same utilization rate, November 15 - February 15 each year, was accompanied by a reduction in runoff and sediment yield of about 29 percent. The same change in use, except for grazing allowed every other year during the sheep grazing period. every other year during the sheep grazing allowed every other year during the sheep grazing period, resulted in a reduction in runoff and sediment yield of about 20 percent. (Woodard-USGS)

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4C-Effects On Water Of Man's Non-Water Activities

A MODEL FOR EVALUATING RUNOFF-QUALITY IN METROPOLITAN MASTER PLANNING, Water Resources Engineers Inc., Walnut Creek,

For primary bibliographic entry see Field 5B.

4D. Watershed Protection

WILLAMETTE RIVER SEDIMENT MANAGE-MENT POSSIBILITIES: PHASE I -- PROBLEM CLARIFICATION,

Oregon State Univ., Corvallis. Water Resources Research Inst.

For primary bibliographic entry see Field 2J. W80-03008

EFFECTS OF STEM DENSITY UPON SEDI-MENT RETENTION BY SALT MARSH CORD-GRASS, SPARTINA ALTERNIFLORA LOISEL, Virginia Univ., Charlottesville. Dept. of Environ mental Science

M. L. Gleason, D. A. Elmer, N. C. Pien, and J. S.

Estuaries, Vol 2, No 4, p 271-273, December 1979. 4 Fig, 6 Ref.

Descriptors: *Sediments, *Sands, *Grasses, *Beaches, Waves(Water), Vegetation, Vegetation establishment, Deposition(Sediments), Coasts, Shores, Slopes, Erosion, Erosion control, Laboratory tests, Salt marsh cordgrass

A laboratory experiment was conducted to deter-A laboratory experiment was conducted to deter-mine whether retention of waterborne sand by salt marsh cordgrass, Spartina alterniflora Loisel, is directly related to the number of stems per unit area. Waves generated in a trough washed over a sloping beach planted with S. alterniflora springs; a sioping beach planted with s. aiternitiora springs; a range of stem densities (0-108 stems/sq m) was examined in separate trials. The amount of sand accumulated after 60 waves was a positive nonlinear function of stem density. The greatest accretion coincided with the highest stem density tested. Shape of the beach profile was also strongly influenced by the number of stems per sq m. (Sims-ISWS) ISWS) W80-03026

PREVENTION OF LONG-TERM ECOLOGI-CAL DAMAGE IN A DROUGHT, Botswana Ministry of Agriculture, Gaborone. Div.

of Land Utilization.

I M I

F. S. Alidi. F. S. AHGI. In: Proceedings Symposium on Drought in Bo-tswana, June 5-8, 1978, Gaborone. Published by the Botswana Society in collaboration with Clark University Press. p 261-268, 1979. 1 Tab, 3 Fig.

Descriptors: *Droughts, *Water management(Applied), *Accelerated *Acce

Several means by which long-term ecological damage by drought in Botswana can be minimized are discussed: (1) training and education of agriculare discussed: (1) training and education of agricul-turists and meteorologists, particularly with regard to water use, (2) establishment of weather stations to supply the country with weather reports and data to help in the development of water sources for agriculture and industry, (3) dissemination of a better understanding of the causes and effects of overgrazing, veld fires, devegetation, lack of soil cover, lack of protection against wind and rainfall erosion - at the local level particularly, (4) stabili-zation of areas against further desert encroachment by planting harider species and by avoiding over-exploitation of that area, (5) reduction of wildlife exploitation of that area, (5) reduction of wildlife and livestock populations to correlate with carrying capacity, and (6) improved farming methods for crop production. The effect of devegetation on local water balance is most significant when bare soil is less able to capture and absorb what rain does fall, and runoff accelerates while underground water and springs are deprived of re-charge. For these reasons this author is convinced

that overgrazing and over-exploitation of Botswa-na's natural resources, rather than actual rainfall deficiency, are the main causes of drought. (Tickes-Arizona) 80-03076

AN IMPROVED SEDIMENT DELIVERY MODEL FOR PIEDMONT FORESTS,
Georgia Univ., Athens. School of Forest Re-

R. G. Burns.

Available from the National Technical Information Service, Springfield, VA 22161 as PB80-139801, Price codes: A05 in paper copy, A01 in microfiche. Environmental Resources Center, Georgia Institute of Technology, Atlanta. Technical Completion Report No ERC 03-79, June 1979. 80 p. 6 Fig. 12 Tab, 26 Ref., 1 Append. OWRT A-053-GA(1).

Descriptors: *Sediment control, *Forest management, *Model studies, Georgia, Sediment transport, Erosion control, Watershed management, Soil stability, Soil moisture, Pine trees, Runoff, Rainfall, Lumber, Clear-cutting, Forest soils, Lumbering

Two similar watersheds in the pine production area of the central Georgia piedmont were studied to develop an improved sediment delivery model for use as a management tool for forest harvesting and site preparation. Eight watershed segments were instrumented in the treated basin and four in the untreated control basin. The treated basin was commercially clearcut then prepared in two stages with drum roller choppers. Thirty-one sets of data were collected for rainfall, runoff, and fine sediment delivery. Other data collected include the occurrence, location, and condition of all bare soil occurrence, location, and condition of all bare soil in each area during each phase of harvesting and site preparation. the model, based in part on the universal soil loss equation has three components: energy, site, and erosion hazard. Tested as indices of the energy component were the rainfall erosi-vity factor R, gross precipitation Pg, and the prod-uct of runoff volume and peak discharge rate Qvp. Soil erodibility K, watershed segment slope S, average sediment topographic slope length L, and gully density G were tested as site component guily density G were tested as site component indices. For the erosion hazard component total bare soil B, a new erosion hazard index W, and its approximation Wa were used. Several model combinations were tested and all were superior to previous models. Use of the W hazard index indicates that minimal bare soil and maximum distance to stream channels are important management concerns for forest harvest practices. (Seigler-IPA) W80-03081

HYDROLOGIC CONSIDERATIONS IN DECISION ANALYSES FOR RECLAIMING STRIP MINE LAND IN THE SOUTHWEST, Arizona Univ., Tucson. Dept. of Watershed Man-

agement.

For primary bibliographic entry see Field 4A. W80-03176

FILTRATION OF SEDIMENT BY SIMULATED VEGETATION II. UNSTEADY FLOW WITH NON-HOMOGENEOUS SEDIMENT. NON-HOMOGENEOUS SEDIMENT, Kentucky Univ., Lexington. Dept. of Agricultural

Engineering. J. C. Hayes, B. J. Barfield, and R. I. Barnhisel. Transactions of the American Society of Agricultural Engineers, Vol 22, No 5, p 1063-1067, September-October 1979. 6 Fig, 2 Tab, 12 Ref.

Descriptors: *Sediment control, *Grasses, *Model Descriptors: 'Seatment control, 'Grasses, 'Model studies, Mathematical models, Vegetation, Vegeta-tion effects, Construction, Mining, Strip mines, Fil-ters, Filtration, Deposition(Sediments), Sedimenta-tion, Sedimentology, Grass sediment filters.

Reduction of sediment yield from disturbed areas such as strip mines and construction sites has continued to be a problem. Vegetal filtration has preunued to be a problem. Vegetal Iltration has pre-viously been recommended as a means of reducing the quantity of sediment which reaches the streams and rivers. Recent successful studies using uni-formly sized particles in simulated erect vegetation have led to a series of equations which have been proposed to define the deposition within a grass filter. These equations utilized a spacing hydraulic radius to define the characteristic length applicable to the calculation of a Reynold's number. Prediction of mean velocity and channel bottom drag force were determined using this Reynold's number. These relationships were then used in conjunction with Einstein's sediment transport parameters for determination of total load transport in an artificial media Barfield and others resented. rameters for determination of total load transport in an artificial media. Barfield and others presented a model for making these predictions for steady flow conditions. These equations have now been extended to a continuity model for the prediction of the sediment profile with nonuniform particle sizes and time-varying inflows. In addition, some example calculations were shown in this report which demonstrate the sensitivity of the model to changes in various parameters under unsteady flow conditions. (See also W79-10252) (Sims-ISWS) W80-03177

5. WATER QUALITY MANAGEMENT AND **PROTECTION**

5A. Identification Of Pollutants

METHODS FOR THE ASSESSMENT OF AQUEOUS ORGANIC MATERIALS, North Carolina Univ. at Chapel Hill. Dept. of Environmental Science and Engineering. D. W. Schnare, R. F. Christman, and F. K. Pfaender

Pfaender.

Available from the National Technical Information Service, Springfield, VA 22161 as PB80-140049, Price codes: A06 in paper copy, A01 in microfiche. Water Resources Research Institute of the University of North Carolina, Raleigh, Rpt No 145, August 1979. 90 p, 4 Fig, 15 Tab. OWRT A-087-NC(1), 14-34-0001-7070.

Descriptors: *Organic pollutants, Organic compounds, XAD resins, Solute polarity, Flow rates, Elution solvent, Contaminants in water, Non-volatile organics, Hydrogen ion concentration, Resins, Water analysis, Analytical techniques.

XAD resins have been evaluated with a range of known organic compounds for possible use in a fractionation method intended to comprehensively analyze the organic contaminants present in water. Among the parameters investigated are the effects Among the parameters investigated are the effects on the extraction efficiency of solute polarity, flow rate, pH, elution solvent, and the container in which the extraction and elution are carried out. These studies provide a basis for a suggested procedure using XAD resins that can be rapid and efficient for isolating a wide range of non-volatile. efficient for isolating a wide range of non-volatile contaminants from water. Using this method, high recoveries allow isolation and recovery of organics initially present in sub part per billion concentra-tions. Furthermore, water samples can be extracted in the field. Extraction of water and elution of the resin can take place in a single vessel, which eliminates many handling and concentration problems attendant with carbon adsorption methods. The batch desorption characteristic allows for greater recoveries, and spiking of the desorption solvent can provide an internal standard which aids accurate and reproducible quantitation, two significant improvements over other suggested resin methods. This method provides a solution of non-volatile organics in concentrations necessary for GLC or GC/MS identification and quantitation. (Kiger-NC) W80-03006

A RESONANCE RAMAN METHOD FOR THE RAPID DETECTION, IDENTIFICATION AND QUANTITATION OF BACTERIA IN SEWAGE AND NATURAL WATERS,

Rhode Island Univ., Kingston. Dept. of Chemistry.

W. H. Nelson.

Available from the National Technical Information Available from the National Technical Information Service, Springfield, VA 22161 as PB80-138522, Price codes: A02 in paper copy, A01 in microfiche. Rhode Island Water Resources Center, University of Rhode Island, Completion Report, 1979. 18 p, 4 Fig, 3 Tab, 24 Ref. OWRT B-078-RI(1).

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants-Group 5A

Descriptors: *Spectroscopy, *Sewage bacteria, *Aquatic microorganisms, *Chemical analysis, Spectrometers, Fluorescence, Sanitary engineering, Water pollution sources, Pathogenic bacteria, Resonance, Coliforms, Water quality, Resonance

Resonance Raman spectroscopy was used to rapidly identify and quantify chromogenic bacteria in water. A rapid and reliable method such as this water. A rapid and reliable method such as this would be a valuable tool for testing for bacterial contamination in public water supplies as the currently used coliform standards are time consuming and in many cases nonspecific. A series of carotene-containing bacteria were studied including Agmanellum quadruplicatum, Coccochloris elabens, and Rhodopseudomonas palastris. A standard Spex Model 1401 spectrometer with a photon counting detection system was used with incident light at 514.5 and 488.0 nm supplied by a Model CR-2 argon ion laser. Line intensities and energies are presented. Two intense bands were found for CR-2 argon ton insert. Line intensities and energies are presented. Two intense bands were found for specific, interpretable resonance Raman spectra. The spectra were simply obtained, of high quality, and are reproducible. The method will allow for the rapid identification of microorganisms in the presence of 'contaminants' such as sewage and water. (Seigler-IPA) W80-03087

ENHANCEMENT OF LUMINOL CHEMILU-MINESCENCE WITH HALIDE IONS, Maine Univ. at Ornon. Dept. of Chemistry. D. E. Bause, and H. H. Patterson. Analytical Chemistry, Vol 51, No 13, p 2288-2289, November 1979. 2 Tab, 6 Ref. OWRT B-016-

Descriptors: *Bromides, *Chemical analysis, *Spectrophotometry, *Water analysis, Fuores-cence, Chromium, Chlorides, Halides, Freshwater, Saline water, Fluorometry, Sea water, Water chemistry, Anions

Improvements in the use of chemiluminescence analysis to detect trace Cr(III) in marine and freshwater environments are reported. This analysis is based upon the oxidation of luminol by hydrogen peroxide in basic aqueous solutions with Cr(III) as the catalyst. Several ions, C1(-), F(-), and SO4(2-) have been found to enhance chemiluminescence intensity, however, for the bromide ion intensity increase is eightfold and is proportional to Cr(III) concentration. Although the mechanism of this bromide enhancement is not clear it appears to be an ion-pairing phenomenom. Enhancement data were obtained using a flow system with two 20-ml plastic syringes. One syringe contained the Cr(III) sample and the other contained a solution of luminol and hydrogen peroxide. The solutins were mixed prior to entering a Perkin-Elmer MPF-44A Fluorescences Spectrophotometer for measurement of signal responses. With the use of bromide ion enhancement the detection limit for Cr(III) has to enhancement the detection limit for C(111) has been significantly lowered to 1.3 X 10 to the minus 10th power M and the enhancement is applicable to both fresh and marine water analysis. (Seigler-IPA)
W80-03094

SALMONELLA SP. HARBORED BY AQUATIC FAUNA AS INDICES OF FECAL POLLUTION, Purdue Univ., Lafayette, IN. Water Resources Research Center

E. V. Morse, K. A. Gossett, and R. L. Lawton. Available from the National Technical Information Avanaore from the National Technical Information Service, Springfield, VA 22161 as PB80-140064, Price codes: A04 in paper copy, A01 in microfiche. Technical Report No 127, January 1980. 59 p, 5 Fig, 22 Tab, 36 Ref, 1 Append. OWRT B-076-IND(5).

Descriptors: *Salmonella, *Water pollution source, *Indicator bacteria, Aerobic bacteria, Fish, Aquatic life, Bioindicators, Water quality, *Indices,

The presence of the bacteria Salmonella in the aquatic environment indicates fecal pollution. This study identifies salmonella as a useful and reliable index of contamination of bodies of water used for

drinking, bathing, fishing, or aquatic recreational activities. Techniques for collecting water samples were developed. Eleven serotypes were found among 131 salmonella isolates when Wabash River (IND) native fish and fresh water mussels were natural. Selected the sample of solar possible of solar p cultured. Salmonellae were found capable of colonizing the intestinal tract of native fishes. Higher concentrations of salmonellae were found in fish intestinal tracts than were present in environmental intestinal tracts than were present in environmental water. Several serotypes were present in the fish which were not present in their habitat water. Increased eutrophy of the water decreased infection rates. However when bottom sediment was allowed to 'build up' increased infection rates were evident. Physiological stress increased piscine salmonella infection rates. It is concluded that Salmonella may be used as monitors of feea pollution in nella may be used as monitors of fecal pollution in the aquatic biosphere. The bacteria when present in native fishes, may be retrospective indices of fecal pollution. The presence of Salmonella in any body of water raises serious questions as to its safety, i.e. drinking and total body immersion, both for man and livestock. (Wiersma-Purdue) W80-03173

BIOCHEMICAL SIGNIFICANCE OF ARSENI-CAL POLLUTANTS IN A POTABLE WATER

SUPPLY,
Rutgers - The State Univ., New Brunswick, NJ.
Deni. of Environmental Science.

S. D. Faust, and W. H. Clement.
Available from the National Technical Information
Service, Springfield, VA 22161 as PB80-140031,
Price codes: A02, in paper copy, A01 in microfiche. Final Technical Completion Report, Water
Resources Research Institute, Rutgers University,
January 1980. 18 p. 3 Fig. 7 Tab, 22 Ref. OWRT
A-051-NJ(1), 14-34-0001-8032.

Descriptors: *Arsenic compounds, Aerobic conditions, Anaerobic conditions, Mud, Pollutant identification, Toxins, Contaminants, Contaminant release. Simulated reservoirs

The essential results of this study are that greater percentages of arsenic were released from contaminated muds under anaerobic conditions (in the water phase) and at slightly faster rates than under water phasey and at signity laster rates than under-aerobic conditions. In one of the experiments, ex-posure to sunlight appeared to catalyze the arsenic release under both aerobic and anaerobic condi-tions. The aerobic release of arsenic is an atypical condition. Greater releases of arsenic are typically from anaerobic conditions. Concurrent experifrom anaerobic conditions. Concurrent experi-ments on iron release from contaminated muds showed greater percentages of Fe2+ were re-leased under anaerobic than under aerobic conditions. No firm conclusions were drawn. There are, however, strong indications that anaerobic condiintowers, strong inducations into anaerobic contributions may yield greater quantities of arsenic compounds in the reduced valence state (+III) than aerobic conditions where the (+V) valence state would predominate. That the anaerobic chemistry would predominate. That the anaerobic chemistry of arsenic release may be linked to iron is suggested. The release of ferrous phosphate compounds from anaerobic lake sediments to overlying waters is documented quite well in the literature. Since the chemistries of arsenic and phosphate are similar, dissolution of ferrous arsenite compounds may account for both iron and arsenic release.

TILLAGE SYSTEM EFFECTS ON SEDIMENT AND NUTRIENTS IN RUNOFF FROM SMALL WATERSHEDS, Iowa State Univ., Ames. Dept. of Agricultural

Engineering.
For primary bibliographic entry see Field 5B.
W80-03183

NUTRIENT LOADS IN STREAMFLOW FROM SANDY SOILS IN FLORIDA, Florida Univ., Gainesville. Dept. of Agricultural

Engineering.
For primary bibliographic entry see Field 5B.
W80-03184

RELATIONSHIPS BETWEEN STREAM DISCHARGE AND YIELD OF DISSOLVED SUB-

STANCES FROM A COLORADO MOUNTAIN WATERSHED,
Colorado Univ., Boulder. Dept. of Environmental,
Population, and Organismic Biology.
For primary bibliographic entry see Field 5B.
W80-03191

EFFECTS OF ABRUPT CHANGE IN WATER QUALITY ON RAINBOW TROUT (SALMO GARDNERI RICH.), Genoa Univ. (Italy). Inst. of Zoology.
A. Arillo, L. Lamba Doria, C. Margiocco, F. Melodia, and P. Mensi. Memorie dell'Istituto Italiano di Idrobiologia, Vol 36, p 91-108, 1978. 4 Fig. 3 Tab, 55 Ref.

Descriptors: *Rainbow trout, *Biochemistry, *Water quality, Amino acids, Proteins, Water chemistry, Trophic level, Fish physiology, Animal metabolism, Chemical analysis, *Tissue analysis.

300 specimens of Salmo gairdneri, acclimated to running water from Lake Maggiore, were intro-duced, after one or two day starvation into experiduced, after one or two day starvation into experimental tanks containing water from Monate, Mergozzo, Maggiore (controls), Comabbio and Varese lakes, which present increasing trophic levels. By the end of the experiment (4 hr) the concentrations of several compounds (e.g. aminoacids, glycogen, glucose, lactate, malate and cyclic AMP) in the liver were assayed, along with the hemoglobin content of the skin mucus. Only alanine and glycogen levels departed from those reported in the literature for Salmo gairdneri. (Deal-EIS) W80-03210

EUTROPHICATION, MINUTE ALGAE AND INEFFICIENT GRAZERS, Oslo Univ. (Norway). Inst. of Zoology. For primary bibliographic entry see Field 5B. W80-03211

A STUDY OF THE DISTRIBUTION OF MER-CURY IN THE VARIOUS COMPARTMENTS OF THE NORTH SEA AND SCHELDT ESTU-ARY ECOSYSTEMS, Beheerseenheid Model Noordzee en Schelde Brus-

Benetrseemien Model Noordzee en Scheide Brits-sel, (Belgium). W. Baeyens, G. Decadt, and I. Elskens. Oceanologica Acta, Vol 2, No 4, p 447-457, 1979. 11 Fig. 7 Tab, 32 Ref.

Descriptors: *Mercury, *Path of pollutants, *Thermodynamic behavior, Ecosystems, Estuaries, Phytoplankton, Zooplankton, Bottom sediments, Physicochemical properties, Chemical reactions, Water chemistry, Heavy metals, *North Sea, *Tissue analysis, *Methylmercury, Scheldt Estu-

The distribution of mercury in various compart-ments of the North Sea and Scheldt ecosystems ments of the Poth Sea and Schedul ecosystems was investigated. The experimental results showed that: (1) in the North Sea, the ratio of particulate to dissolved mercury in the water column was close to 1:1, while in the estuary (particularly in its upper portion) this ratio was much higher; (2) the mercury content of living organisms was higher in phyto- and 200-plankton than in fish, although detrital matter still contained about five times more mercury than phytoplankton; and (3) the concentration of mercury in marine sediments was situated between those found in zooplankton and fish. ated between those found in zooplankton and fish. Thermodynamic stability diagrams for aqueous and solid mercury compounds in seawater and brackish water provided valuable information for the interpretation of the observed mercury distribution. Under reducing conditions, mercury-sulphide compounds were predominant, in both water systems. These compounds play a very important role in the accumulation and release of mercury in sediments (the stable solid compound under reducsediments (the stable solid compound under reduc-ing conditions, cinnabar, determines the mobility ing conditions, cinnabar, determines the mobility of mercury in the interstitial water), and in living organisms (the latter produce metallothioneins, which contain a large number of -SH groups and show high affinities for mercury). In combination with electrostatic forces these compounds probably also play a role in the process of adsorption of Hg C13-, which is theoretically the predominant

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

mercury compound in the North Sea and the major part of the Scheldt estuary, on suspended matter. (Deal-EIS) W80-03213

TOXICITY TESTING IN THE UNITED KING-DOM FOR THE EVALUATION OF OIL SLICK DISPERSANTS,

Ministry of Agriculture, Fisheries and Food, Burn-ham-on-Crouch (England). Fisheries Lab. M. G. Norton, F. L. Franklin, and R. A. A.

Blackman.

In: Chemical Dispersants for the Control of Oil Spills, ASTM STP 659, L. T. McCarthy, Jr., G. P. Lindblom and H. F. Walter, Eds., American Society for Testing and Materials, p 18-34, 1978. 4 Fig, 6 Tab, 9 Ref.

Descriptors: *Toxicity, *Bioassay, *Methodology, Testing procedures, Analytical techniques, Oil spills, Oil, Organic compounds, Water pollution control, Shrimp, Mortality, *Dispersants, *Oil dis-

Until recently, the toxicity of dispersants approved for use in U.K. waters was evaluated by a static bioassay on the dispersant alone. Following the 1974 Dumping at Sea Act, dispersant evaluation methods were reviewed and dispersants are now licensed for sea (offshore) or for beach use, based on two tests to assess the environmental effect of on two tests to assess the environmental effect of the dispersant use. The 'sea' test assesses the toxicity to Crangon crangon of a chemically dispersed oil and compares it with the toxicity of the oil alone. Mortality is measured over a period of 100 min at an oil concentration of 1000 ppm. The 'beach' test assesses the toxicity of the dispersant alone to a typical intertidal organism, Patella vulgata, by spraying with dispersant and rinsing in a simulated tidal cycle. Mortalities are measured after 72 h and compared with those of an oil control. The rationale behind the development of these tests is described, together with the experiments. these tests is described, together with the experimental results. The U.K. criteria for licensing products on the basis of these test results are also discussed. (Deal-EIS) scussed. (Deal-EIS) W80-03214

ACUTE AQUATIC TOXICITY AND DISPERSING EFFECTIVENESS OF OIL SPILL DISPERSANTS: RESULTS OF A CANADIAN OIL DISPERSANT TESTING PROGRAM (1973 TO

Environmental Protection Service, Halifax (Nova

K. G. Doe, and P. G. Wells.

JMI

R. U. Doe, and P. G. Wells.

In: Chemical Dispersants for the Control of Oil Spills, ASTM STP 659, L. T. McCarthy, Jr., C. P. Lindblom and H. F. Walter, Eds., American Society for Testing and Materials, p 50-65, 1978. 5 Tab, 56 Ref.

Descriptors: *Oil spills, *Toxicity, *Bioassay, Oil, Organic compounds, Rainbow trout, Killifishes, Lobsters, Water pollution control, Water quality standards, Surfactants, Lobsters, *Dispersants, *Oil dispersants, *Crude oil.

An oil spill dispersant testing program was initiated in 1973 to evaluate the toxicity and dispersing effectiveness of dispersants submitted to Fisheries and Environment Canada for approval prior to use in Canadian waters. Screening toxicity tests with rainbow trout (Salmo gairdneri) were performed initially on 19 dispersants. Thirteen were considered sufficiently nonacutely toxic to justify further evaluation using methods and criteria of the Canadian Guidelines on the use and acceptability of oil of the use and acceptability of oil spill dispersants. The dispersants BP1100X, Corexit 8666, Drew Chemical OSE 71, Drew Chemical OSE 72, Oilsperse 43, and Sugee 2 passed both the toxicity and effectiveness criteria and were placed on the Canadian standard list of acceptable oil spill dispersants. Acute lethal toxicity tests with BP1100X and Sugee 2 showed that rainbow trout in fresh water were more sensitive than two marine fish, Fondulus heteroclitus and Menidia menidia, while fourth-stage larval lobsters, Homarus americanus, were the least sensitive. (Deal-EIS)

EFFECT OF A CHEMICAL DISPERSANT ON MICROBIAL UTILIZATION OF PETROLEUM HYDROCARBONS, Rhode Island Univ., Kingston. Dept. of Plant Pa-

Knode Island Univ., Kingston. Dept. of Plant Pathology-Entomology.
R. W. Traxler, and L. S. Bhattacharya.
In: Chemical Dispersants for the Control of Oil
Spills, ASTM STP 659, L. T. McCarthy, Jr., G. P.
Lindblom and H. F. Walter, Eds., American Society for Testing and Materials, p 181-187, 1978. 3
Fig., 1 Tab, 6 Ref.

Descriptors: *Oil, *Microbial degradation, *Tox ity, Oil spills, Organic compounds, Bacteria, Metabolism, Biochemical oxygen demand, Path of pollutants, Sea water, Water pollution control, *Dispersants, *Oil dispersants, *Crude oil, *Cor-

The dispersant Corexit 9527 was found to enhance bacterial metabolism of Kuwait and South Louisiana crude oils as well as pure hydrocarbons in nonmechanically agitated seawater systems. Oxygen depletion, measured by a modification of the Biological Oxygen Demand (BOD) method, was used to determine the rate of substrate and mixed substrates oxidation by raw seawater populations of bacteria. This method demonstrated significantly increased oxidation of crude oil treats. nificantly increased oxidation of crude oil treated nurcanty increased oxidation of crude oil treated with dispersants. Mineralization studies, with 14C labeled hydrocarbon, substantiated the BOD results and also indicated that alkanes were metabolized prior to aromatic components in crude oils. (Deal-EIS) W80-03216

THE ROLE OF ZOOPLANKTON FECAL PELLETS IN THE SEDIMENTATION OF POLYCY-CLIC AROMATIC HYDROCARBONS IN DABOB BAY, WASHINGTON, Washington Univ., Seattle. Dept. of Oceanography.

raphy. F. G. Prahl, and R. Carpenter. Geochimica et Cosmochimica Acta, Vol 43, p 1959-1972, 1979. 7 Fig, 4 Tab, 48 Ref.

Descriptors: *Path of pollutants, *Aromatic com-Descriptors: "Part of politutants, "Arromatic com-pounds, "Zooplankton, Bottom sediments, Season-al, Runoff, Water chemistry, Water pollution sources, Diatoms, Phytoplankton, Chemical analy-sis, Gas chromatography, Lead radioisotypes, Ra-dioactive dating, Aluminum, Dabob Bay, Washing-ton, "Fecal pellets.

Polycyclic aromatic hydrocarbon (PAH) composirolycyclic aromatic hydrocaroon (PAH) composi-tions were determined in plankton, sediment-trap-collected particulate material and sediment cores from Dabob Bay using a high performance liquid chromatographic/fluorescence technique. The annual flux of individual PAH measured in a series of sediment traps was compared with the flux of corresponding compounds determined from 210Pb dated bottom sediments. Systematic seasonal variations in the fluxes and concentrations of PAH, A1 and organic carbon in the trap-collected particu-lates and seasonally collected plankton were also investigated to determine whether or not PAH are associated with either terrestrial or marine-derived materials. Concentrations of all PAH studied in-creased tenfold within the last 80-100 yr of sediment deposition, except for perylene which dis-played a reasonably constant concentration profile. This suggests at least two sources contribute to the sedimentary PAH compositions Dabob Bay, i.e., anthropogenic combustion and a natural source. Plankton and sediment trap-collect-ed particulates contained PAH mixtures qualitatively similar to underlying surface sediments. Mi-croscopic examination indicated fecal pellets were the major form of particulate material in the sedi-ment traps. The fecal pellets collected in the sediment trap time series quantitatively account for essentially 100% of the PAH fluxes measured in the 210Pb dated sediments, implying zooplankton fecal pellets control the removal of PAH to Dabob Bay sediments. (Deal-EIS) W80-03220

INITIAL TESTING OF A RECENT BIOLOGI-CAL MONITORING CONCEPT, Virginia Polytechnic Institute and State Univ.,

Blacksburg. Center for Environmental Studies. D. Gruber, J. Cairns, Jr., K. L. Dickson, A. C. Hendricks, and W. R. Miller, III. Journal of the Water Pollution Control Federation, Vol 51, p 2744-2751, 1979. 7 Fig, 18 Ref.

Descriptors: *Bioindicators, *Sunfishes, *Bioassay, Monitoring, Industrial wastes, Fish physiology, Automation, Automatic control, Computers, Re-search equipment, Electrical equipment, Analytical techniques, Chlorination, Water chemistry, Oil spills, Chemical wastes.

The development of a recent concept of biological monitoring for continuously assessing industrial effluents is presented. Bluegill sunfish, Lepomis macrochirus, are used as biological sensors, and a small on-line computer facilitates the monitoring of the ventilatory rates of the fish, thereby automating the system. Chemical and physical monitors are also connected to the computer system, and an automatic refrigerated water sampler has been incorporated to facilitate more advanced chemical analysis. For the purpose of comparing the sensitivity of the present biological monitoring system with that of more conventional methods of toxicity testing, a continuous-flow acute bioassay unit is with that of more conventional methods of toxicity testing, a continuous-flow acute bioassay unit is being included. Initial testing of the biomonitoring unit is being included. Initial testing of the biomonitoring system has demonstrated its practicality by incorporating a standard mixture from the petroleum industry (arbitrary reference mixture), a sodium hypoclority solution, and chlorinated tapwater as test effluents. (Deal-EIS) W80-03221

EFFECT OF ENVIRONMENTAL SALINITY OF HAEMOLYMPH AND TISSUES OF MUSSELS, Akademiya Nauk SSSR, Leningrad, Lab. of Comparative Biochemistry of Inorganic Ions.

1. A. Skul'skii, I. V. Burovina, N. B. Pivovarova,

T. I. Ivanova, and A. V. Lapin.

The Soviet Journal of Marine Biology, Vol 5, p 28-31 1070 2 Fig. 2 Tab. 12 Ref. 33, 1979. 3 Fig, 2 Tab, 12 Ref.

Descriptors: *Salinity, *Mussels, *Ions, Sodium, Animal physiology, Animal metabolism, Potas-sium, Habitats, Adaptation, Membrane processes, Osmosis, *Tissue analysis.

The content of ions in the tissues of mussels inhab-The content of ions in the tissues of mussels inhabiting seas with different salinities is investigated. The concentration of Na+ in the haemolymph of mussels and environment is always the same, while the distribution coefficient of K+ of haemolymph/environment increases as the salinity decreases. At the same time the absolute values of intracellular concentrations of K+ and Na+ in the muscles and nerve cells drop and the concentration gradients of cell/haemolymph change within narrow limits. (Deal-EIS) (Deal-EIS) W80-03222

INFLUENCE OF CERTAIN WASTE WATERS CONTAINING AMMONIA, UREA AND METHANOL ON UNICELLULAR MARINE ALGAE (IN FRENCH),

Institut Romania de Recherches Marines, Constan-

P-E. Mihnea.

r-E. Minnea.
In: IVes journees d'études sur les pollutions marines en Mediterranee, Commission Internationale Pour L'Exploration Scientifique de la Mer Mediterranee, Monaco, 24-27 November 1978, Antalya, Turkey, p 465-469, 1979. 4 Fig, 2 Tab, 2 Ref, (English abstract).

Descriptors: Water pollution effects, *Nutrients, *Phytoplankton, *Laboratory tests, Bioassays, *Ammonia, *Utrea, Methanol, Domestic wastes, Industrial wastes, Laboratory tests, Algae, Phytoplankton, Nitzschia, Skeletonena, Chlamydo-

The results of experiments with waste waters (containing: methanol, ammonium, urea, and mixtures of these) on some unicellular algae are given (Nitschia and Chlamydomonas). The destructive or stimulating effects are presented as LT50, T90, recovering capacity, cells division, and have an essential specific feature. Ammonia is more toxic to

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants—Group 5A

the algae than methanol. In very low concentra-tions these substances stimulate the division of the algae. In nature these substances stimulate the growth of algal blooms. (Katz-EIS) W80-03227

LEVELS OF METAL POLLUTANTS IN SEDI-MENTS AND BIOTA OF THE GULF OF TRI-ESTE: A LONG TERM SURVEY, Trieste Univ. (Italy). Inst. of Hygiene. L. Majori, G. Nedoclan, G. B. Modonutti, and F.

L. Majoni, G. T. Majoni, G. Majo

Descriptors: *Metals, *Monitoring, *Aquatic environment, *Bioindicators, Trace elements, *Cadmi-um, *Cobalt, *Chromium, *Copper, *Iron, *Mer-cury, Manganese, Nickel, *Lead, *Zinc, Mussels, Water chemistry, Bottom sediments, Marine fish, Mullets, *Arsenic, *Tissue analysis, *Bioaccumula-

Given is a summary of observations made over several years regarding the content of trace elements (As, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pt. Zn) in the components of the marine environment (e.g. sea water, sediments, and various species of fish). Our studies of contamination levels show that Mytilus galloprovincials LmK is a practical and simple research tool for monitoring marine metal pollution. It is suggested that these 'biological samplers' be used on a large scale, so as to make it possible to draw a map of metal pollution. (Deal-EIS)
W80-03228

TRACE ELEMENTS IN PELAGIC ORGAN-ISMS AND A PELAGIC FOODCHAIN OF THE AEGEAN SEA, Democritus Nuclear Research Center, Athens

Democritus Nuclear Research Center, Athens (Greece). Radioanalytical Lab.
C. Papadopoulou, D. Zafiropoulos, I. Hadjistelios, M. Vassilaki-Grimani, and C. Yannopoulos.
In: IVes journees d'etudes sur les pollutions marines en Mediterranee, Commission Internationale Pour L'Exploration Scientifique De La Mer Mediterranee, Monaco, 24-27 November 1978, Antalya, Turkey, p 231-232, 1979.

Descriptors: "Food chains, "Path of pollutants, "Trace elements, "Zinc, "Cobalt, "Cesium, Chemical analysis, Marine fish, Plankton, Water chemistry, Metals, "Selenium, "Rubidium, "Vanadium, "Arsenic, "Tissue analysis, "Biomagnification.

Plankton, Euphasia kronii, and the pelagic fish species Trachurus mediterraneus and Scomber japonicus colias were analysed for the elements As, V, Se, Co, Cs, Zn and Rb. Concentrations of As, Zn, Co, Se, and Rb in Scomber compared well to those in Trachurus whereas V values were one order of magnitude higher in Trachurus. Assuming that the plankton samples of different size and Trachurus represent 5 different levels of a pelagic food chain, no trend of food chain magnification was observed. (Deal-EIS)

POLLUTION MONITORING OF ELEVEN TRACE ELEMENTS IN THREE MARINE OR-GANISMS FROM SARONIKOS GULF,

Democritus Nuclear Research Center, Athens (Greece), Radioanalytical Lab. A. P. Grimanis, C. Papadopoulou, D. Zafiropoulos, M. Vassilaki-Grimani, and N.

Isimentois.

In: IVes journees d'etudes sur les pollutions marines en Mediterranee, Commission Internationale
Pour L'Exploration Scientifique De La Mer Mediterranee, Monaco, 24-27 November 1978, Antalya,
Turkey, p 233-234, 1979. 1 Fig.

Descriptors: *Trace elements, Monitoring, *Water chemistry, *Cadmium, *Cobalt, *Chromium, *Cesium, *Iron, *Mercury, *Zinc, *Mullets, Mus-

sels, Chemical analysis, Water quality standards, Water pollution effects, *Silver, *Rubidium, *Selenium, *Tissue analysis, *Antimony, Greece, Saronicos Gulf.

Levels of eleven trace elements (Ag, Cd, Co, Cr, Cs, Fe, Hg, Rb, Sb, Se, and Zn) have been deter-Cs, Fe, Hg, Rb, Sb, Se, and Zn) have been determined by neutron activation analysis in the muscle of Mullus barbatus and Parapenaeus longirostris as well as in the whole body of Mytilus galloprovincialis from Saronicos Gulf, Greece, during a two-year period (1975-1977). Only one Hg value (570 ug/kg wet weight) was found to be slightly higher than the WHO maximum permissible level. No similiforat personal or recognition stratistics. significant seasonal or geographic variations were observed except for P. longirostris specimens col-lected during summer 1976 from a single station. No pollution effects were noted. (Deal-EIS) W80-03230

TRACE METALS AND ORGANOCHLORINE RESIDUE CONTENT OF MULLIDAE FAMILY FISHES AND SEDIMENTS IN THE VICINITY OF ERDEMLI (ICEL), TURKEY, Middle East Technical Univ., Ankara (Turkey). Deet of Mexics Science.

Dept. of Marine Science.
T. I. Balkas, I. Salihoglu, G. Tuncel, S. Tugrul,

and G. Ramelow.

and C. Rameiow.

In: IVes journees d'etudes sur les pollutions marines en Mediterranee, Commission Internationale Pour L'Exploration Scientifique De La Mer Mediterranee, Monaco, 24-27 November 1978, Antalya, Turkey, p 159-163, 1979. 2 Tab, 15 Ref.

Descriptors: *Heavy metals, *Chlorinated hydro-carbon pesticides, *Mullets, Gas chromatography, Spectrometry, Chemical analysis, *Mercury, *Copper, *Cadmium, *Zinc, *Lead, *DDT, DDD, DDE, Aldrin, Dieldrin, *Polychlorinated biphen-DDE, Aldrin, Dieldrin, *Polychlorinated biphen-yls, Pesticide residues, Bottom sediments, Turkey, Erdemli, *BHC, *Heptachlor, *Tissue analysis.

The organochlorine residue content of three members of the mullidae family, i.e., Mullus barbatus, Mullus surmuletus and Upenus moluccensis caught in the vicinity of Erdemli has been investigated with the aid of gas chromatography. Some trace metals such as Hg, Cu, Cd, Zn, and Pb in the same species have also been investigated with atomic absorption spectrometry. Sediment samples of the area were analysed and their organochlorine residue and trace metal contents determinated. (Deal-EIS)

TRACE ELEMENTS IN MESOPELAGIC AND SOME COASTAL FISH FROM THE ADRIAT-

Nuklearni Inst. Jozef Stefan, Liubliana (Yugosla-P. Stegnar, L. Kosta, V. Ravnik, J. Stirn, and A.

R. Byrne.
In: IVes journees d'etudes sur les pollutions marines en Mediterranee, Commission Internationale Pour L'Exploration Scientifique De La Mer Mediterranee, Monaco, 24-27 November 1978, Antalya, Turkey, p 235-236, 1979. 2 Tab, 5 Ref.

Descriptors: *Trace elements, *Marine fish, Chemical analysis, "Copper, "Mercury, "Manga-nese, "Zinc, Water chemistry, Heavy metals, Path of pollutants, "Arsenic, "Antimony, "Tissue analy-sis, "Arsenic, "Antimony, "Selenium, "Adriatic

Trace elements (As, Cu, Fig, Mn, Sb, Se, Zn) were determined in 6 species of mesopelagic fish (Argyropelecus hemigymnus, Diaphus rafinesqui, Gonichtys coccoj, Maurolicus pennanti, Notoscopelus elongatus, Scopelus benoiti) and 2 selected coastal fish samples (Boops boops, Pagellus erythrinus) from different sampling stations from the Adriatic. When compared to the trace element contents fround in coastal fish it was evident that only Ho found in coastal fish, it was evident that only Hg concentrations were higher in coastal fish, while the opposite situation was found for Zn. The con-centration level for the other elements was nearly the same in mesopelagic and coastal fish speci-mens. (Deal-EIS) MERCURY CONCENTRATIONS IN PELAGIC FISHES (ANCHOVY, MACKEREL AND SARDINE) FROM THE ITALIAN COAST AND STRAIT OF GIBRALFAR, Siena Univ. (Italy). Lab. di Idrobiologio. F. Baldi, A. Renzoni, and M. Bernhard.

F. Baidi, A. Renzoni, and M. Bernhard. In: IVes journees d'etudes sur les pollutions ma-rines en Mediterranee, Commission Internationale Pour L'Exploration Scientifique De La Mer Medi-terranee, Monaco, 24-27 November 1978, Antalya, Turkey, p 251-254, 1979. 4 Fig, 4 Ref.

Descriptors: *Mercury, *Marine fish, Chemical analysis, Habitats, Water chemistry, Geochemistry, Path of pollutants, Coasts, Heavy metals, Growth rates, *Anchovy, *Engraulis, *Scomber, *Sardina, *Mediterranean Sea, *Tissue analysis, *Bioaccumulation, *Italy.

Mercury body burden in Engraulis encrasicolus, Scomber scomber, S. japonicus and Sardina pilchardus caught in Italian coastal waters were compared with the body burden of specimens from the same species obtained from varied locations in the Strait of Gibraltar. The Hg/weight ratio was significantly smaller in the fishes from Strait of Gibraltar than in the fishes from the Italian coast. Because of their relasic pahitst the specimens fost. braltar than in the fishes from the Italian coast. Because of their pelagic habitat the specimens from the Italian coast cannot be contaminated from anthropogenic sources. Their higher Hg body burden must be due to the higher natural Hg concentration in the marine and terrestrial environment near geochemical Hg anomalies. In Mediterranean fishes the Hg body burden was about twice that of the specimens of the same size from the Atlantic. Similar higher body burden was found in Mediterranean tuna which prey on these pelagic fishes. (Deal-EIS) (Deal-EIS) W80-03236

MONITORING OF CHLORINATED HYDRO-CARBONS IN WATER AND SEDIMENTS OF THE NORTH ADRIATIC COASTAL WATERS, Institut Rudjer Boskovic, Rovinj (Yugoslavia). Center for Marine Research.

Center for Marine Research.

N. Picer, and M. Picer.

In: IVes journees d'etudes sur les pollutions marines en Mediterranee, Commission Internationale Pour L'Exploration Scientifique De La Mer Mediterranee, Monaco, 24-27 November 1978, Antalya, Turkey, p 133-136, 1979. 2 Fig, 4 Ref.

Descriptors: *Pesticide residues, *Polychlorinated biphenyls, *Monitoring, Chlorinated hydrocarbon pesticides, DDT, Water chemistry, Bottom sediments, Chemical analysis, Path of pollutants, Analytical techniques, *Adriatic Sea.

Persistent chlorinated hydrocarbons in more than 50 water and sediment samples were analysed over a two-year period (1977-78). Analyses were per-formed on subsurface water samples collected at a depth of 1 m and on samples collected from several surface slicks by means of a Garrett net. Sediment samples were collected by grab sampler. The re-sults of monitoring of chlorinated hydrocarbons in sults of monitoring or chiorinaten nyurocarrons in sea-water samples are discussed from the view-point of the analytical difficulties. Some explana-tions concerning the influence of local pollution sources on the level of chlorinated hydrocarbons in coastal waters of the North Adriatic are given. (Deal-EIS) W80-03237

MONITORING OF CHLORINATED HYDRO-CARBONS IN BIOTA AND SEDIMENTS OF SOUTH ADRIATIC COASTAL WATERS,

SOUTH ADRIATIC COASTAL WATERS,
Biological Inst., Dubrovnik (Yugoslavia).
D. Vilicie, N. Picer, M. Picer, and B. Nazansky.
In: IVes journees d'etudes sur les pollutions marines en Mediterranee, Commission Internationale
Pour L'Exploration Scientifique De La Mer Mediterranee, Monaco, 24-27 November 1978, Antalya, Turkey, p 143-146, 1979. 2 Fig. 5 Ref.

Descriptors: *Pesticide residues, *Monitoring, *Aquatic life, *DDT, DDE, Dieldrin, *Polychlorinated biphenyls, Chlorinated hydrocarbon pesticides, Gas chromatography, Mollusks, Crustaceans, Fish populations, Plankton, Mussels, Sediments, Mullets, Crabs, Oysters, *Adriatic Sea, *Tissue analysis *Tissue analysis

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A-Identification Of Pollutants

During a two year-period of monitoring of chlorinated hydrocarbons in South Adriatic coastal waters, 55 biota (molluscs, crustaceans, fishes, plankton) and sediment samples were collected. Determinations of DDT, TDE, DDE, dieldrin, and PCBs were performed by means of gas chromatography. These data are related to possible sources of pesticide applications. (Deal-EIS) W80-03238

ACCUMULATION AND DISTRIBUTION OF HEAVY METALS IN SOME MARINE ORGAN-ISMS IN THE BAY OF IZMIR AND IN AEGEAN COASTS, Ege Univ., Izmir (Turkey). Dept. d'Oceanographi-cus Biologique.

Ege Univ., 12mir (1 urkey). Dept. d'Oceanographi-que Biologique. H. Uysal. In: IVes journees d'études sur les pollutions ma-rines en Mediterranee, Commission internationale Pour L'Exploration Scientifique De La Mer Medi-terranee, Monaco, 24-27 November 1978, Antalya, Turkey, p 213-217, 1979. 2 Fig, 2 Tab, 10 Ref.

Descriptors: "Heavy metals, "Spatial distribution, "Fish populations, "Mercury, "Cadmium, "Copper, "Cobalt, "Chromium, "Manganese, Zinc, "Iron, "Lead, "Mussels, Mullets, Crabs, Seasonal, Fish migrations, Path of pollutants, Shrimp, "Tuna, "Tissue analysis, Marine fish, Turkey, "Mediterranean Sea, Bay of Izmir.

Concentrations of heavy metals (Hg, Cd, Cu, Co, Cr, Mn, Zn, Fe, Pb) have been measured in Mytilus galloprovincialis, Penaeus kerathurus, Mullus barbatus, Mullus surmuletus, Mugil sp., Thunnus thynnus, Carcinus mediterraneus, over their range of distribution in the bay of Izmir and Aegean coast (Turkey). Mugil sp. and Mullus sp. are most abundant along the coasts of the Aegean. M. galloprovincialis is not found in the south part of Izmir Bay and all the southern part of Turkey. P. kerathurus is found in relatively normal amounts along the Aegean coasts; but in some localities it is very rare. Thunnus thynnus thynnus are most abundant during migration seasons along the Aegean coasts. A comparison of the concentrations of heavy metals in these marine animals which represent different environmental conditions has been determined seasonally for each locality. According to antierent environmental conditions has been deter-mined seasonally for each locality. According to our results the heavy metals concentration of C. mediterraneus was higher than the other species mentioned and the concentration of elements vary according to species, locality and seasons of the year. (Deal-EIS) W80-03239

THE EFFECT OF DDT AND HEXACHLORANE ON ASSIMILATION AND OUTFLOW OF 14C IN PHRAGMITES COMMUNIS, Akademiya Nauk URSR, Kiev. Inst. Hidrobiolo

gii. T. I. Shokod'ko, A. I. Merezhko, and A. I. Lyashenko.

Hydrobiological Journal, Vol 14, No 4, p 91-95, 1978. 1 Fig, 2 Tab, 3 Ref.

Descriptors: *Pesticide kinetics, *Aquatic plants, *Plant physiology, *DDT, Carbon radioisotopes, Radiochemical analysis, Tracers, Photosynthesis, Toxicity, Path of pollutants, Chlorinated hydrocarbon pesticides, Root systems, *Hexachlorane.

The assimilation of 14CO2 by reeds is reduced under the influence of DDT and hexachlorane. That the pesticides have a specific effect on the reaction of photosynthesis and a general toxic effect may be suggested from the shape of the curves showing the dependence of the rate of assimilation of 14CO2 on pesticide concentration. assimilation of 14CO2 on pesticide concentration. The reed is more resistant to DDT than to hexachlorane. A redistribution of 14C occurred in the organis of the reed under the influence of the organic chlorine pesticides. As the concentrations of the preparations increased there was a rise in the absolute amount of radiocarbon flowing into the roots; the mean rate of outflow into the roots is also increased against the background of an in-crease in the relative outflow of 14C-labeled assimilates. Intensification in the outflow of assimilates into the roots in the presence of DDT and hexachlorane is a defense reaction of the reed to the action of the toxic agent. (Deal-EIS)

JMI

W80-03240

HEAVY METALS AND CHLORINATED HY-DROCARBONS IN PELAGIC ORGANISMS FROM THE OPEN MEDITERRANEAN SEA, International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum. S. W. Fowler, J. La Rosa, Y. Unlu, B. Oregioni, and J. P. Villeneuve.
In: IVes journees d'etudes sur les pollutions marines en Mediterranee, Commission Internationale Pour L'Exploration Scientifique De La Mer Mediterranee, Monaco, 24-27 Novembre 1978, Antalya, Turkey, p 155-158, 1979. 9 Ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Heavy metals, *Aquatic environment, Trophic levels, Chemical analysis, Pesticide residues, Polychlorinated biphenyls, DDT, Zinc, Iron, Cobalt, Cesium, Mercury, Plankton, Food chains, Mediternanean Sea, *Tissue analysis, *Tuna, *Arsenic, *Vanadium, *Silver, *Rubidium, *Antimony, *Chamber of the companies of the Scandium

During 1977 pelagic organisms ranging in size from microplankton to tuna were sampled throughout the Mediterranean and analysed for selected heavy metals and chlorinated hydrocarbons. Wherever possible, zooplankton and nekton were sorted into species in order to aid in determining spatial and temporal trends in contaminal levels. Although the data are far from complete for all species, results to date for both categories of pollutants indicate that levels in open Mediterranean organisms in most cases are similar to those reported for pelagic species from other oceanic regions. (Deal-EIS)

SOME OBSERVATIONS ON THE REPRODUC-TION AND EMBRYONIC DEVELOPMENT OF FIVE SPECIES OF FISH KEPT IN EXPERI-MENTAL RADIOACTIVE WATER BODIES, MENTAL RADIOACTIVE WATER BODIES, Akademiya Nauk SSSR, Moscow. Inst. of Evolu-tionary Morphology and Animal Ecology. S. P. Muntyan. Journal of Ichthyology, Vol 18, No 6, p 1033-1038, 1978. 2 Tab, 34 Ref.

Descriptors: *Toxicity, *Strontium radioisotopes, *Embryonic growth stage, Strontium, Cesium, Fish physiology, Animal growth, Animal pathology, Radioactivity effects, Aquaculture, Mortality, *Teratogens, *Tissue analysis.

The reproduction and embryonic development of pike (Esox lucius), perch (Perca fluviatilis), roach (Rutilus rutilus), crucian carp (Carassius carassius) and common wild goldfish (Carassius auratus gibelio) inhabiting radioactive water (Sr-90 and Cs-137) were studied. Normal embryos of all five species survived until complete absorption of the yolk. Following that period abnormalities were noted, including: curvatures of the hody-deformatics and rollowing that period abnormalities were noted, including; curvatures of the body; deformation and incomplete development of myotomes; 'dropsy' of the pericardial cavity and the body cavity; and, disturbances of the cardiovascular system. The feasibility of raising fish in low-level radioactively contaminated water is also discussed. (Deal-EIS) W80-03244

ON THE CORRESPONDENCE OF DATA ON THE INCUBATION OF FISH EGGS IN SOLUTIONS OF STRONTIUM-90 -- YTTRIUM-90 OF VARYING ACTIVITY UNDER LABORAROTY CONDITIONS AND IN NATURAL WATERS, Vserossiiskii Nauchno-Issledovatelskii Inst. Prudpypgp Rybnogo Khozyaistva, Moscow (USSR).

V. L. Pechkurenkov, and G. L. Pokrovskaya.

(USSR). V. L. Pechkurenkov, and G. L. Pokrovskaya. Journal of Ichthyology, Vol 18, No 6, p 995-1004, 1978. 2 Fig, 2 Tab, 26 Ref.

Descriptors: *Fish eggs, *Strontium radioisotopes, *Radiation, Cesium, Radioactivity effects, Toxicity, Size, Fish physiology, Mortality, Genetics, Growth stages, Mode of action, Chromosomes, Sediments, *Yttrium radioisotopes.

Data are presented on the incubation of fish eggs under laboratory conditions in solutions of stron-

tium-90 -- yttrium-90 with a varying activity and in natural waters artificially polluted with strontium-90 -- yttrium-90 and cesium-137. Ways of calculating the correction coefficients for the geometry (sizes) of the eggs when calculating the doses are given. The dose load per egg which is incubated in solutions of strontium-90 -- yttrium-90, prepared from tap water, is determined by the level of accumulation of these radionuclides by the developing egg, while the dose load obtained by the developing egg in a natural body of water, will be determined by the extent of silting up of the egg and the coefficient of radionuclide accumulation in the ooze. (Deal-EIS)

PHYSIOLOGICAL-BIOCHEMICAL DATA ON EXPERIMENTAL INTOXICATION OF FISH

EXPERIMENTAL INTOXICATION OF FISH WITH "YALLAN", Kaspiiskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Astrakhan (USSR).
K. K. Vrochinskiy, and G. V. Zemkov.
Journal of Ichthyology, Vol 18, No 6, p 1004-1009, 1978. 1 Fig. 3 Tab, 22 Ref.

Descriptors: *Herbicides, *Toxicity, *Carp, Larval growth stage, Mortality, Bioassay, Lethal limit, Mode of action, Thiocarbamate pesticides, Fish behavior, Amino acids, Pesticide toxicity, Fish physiology, Animal metabolism, *Yalan, *Blood chemistry, *Glucose, *Tissue analysis.

The limits of the toxicity of the herbicide 'yalan' for 8 day old larvae of the carp, Cyprinus carpio were established. At the moment of intoxication the motor activity is decreased in second year carp with simultaneous increase in the amount of ammonia, urea and hydroperoxides of the lipids in the dorsal white muscle. The amount of glucose in the blood is simultaneously reduced. Herbicide concentrations in water within the limits of 4.5-72 mg/l are acutely toxic for the young of the carp. 2.2 mg/l or less of 'yalan' should be considered as subacute or chronic concentrations. (Deal-EIS) W80-03251

POLYCYCLIC AROMATIC HYDROCARBON CARCINOGENS IN COMMERCIAL SEA-FOODS, British Columbia Cancer Research Center, Van-

B. P. Dunn, and J. Fee.

Journal of the Fisheries Research Board of Canada, Vol 36, p 1469-1476, 1979. 4 Tab, 32 Ref.

Descriptors: *Pollutant identification, *Commercial fish, *Commercial shellfish, Crab, Shrimp, Lobster, Mollusks, Clams, Mussels, Salmon, Trout, Aromatic compounds, Poisons, Creosote, Chemical wastes, Industrial wastes, Gas chromatography, Public health, *Tuna, *Cod, *Sole, *Tissue analysis, *Carcinogens, *Benzo(a)pyrene.

Fresh and processed commercial seafoods were analyzed for the polycyclic aromatic hydrocarbon carcinogen benzo(a)pyrene using a thin-layer chromatographic separation technique and quantitation by fluorescence. Commercial samples of vertebrate fish did not contain detectable levels, except where fish did not contain detectable levels, except where fish were packed with vegetable oil, an exogenous source of carcinogens. Levels in most shellfish samples were generally less than 10 nannog/g wet weight, but occasional samples contained up to 36 nannog/g. Crab and shrimp samples contained little or no benzo(a)pyrene (ND to 0.5 nannog/g). Commercial lobsters contained 0.8 to 7.9 nannog/g. The source of contamination of lobsters was Commercial lobsters contained 0.8 to 7.9 namnog/
g. The source of contamination of lobsters was
further investigated, utilizing high pressure liquid
chromatography to measure 13 polycyclic aromatic hydrocarbon isomers. Freshly caught lobsters
had less than 1 nannog/g benzo(a)pyrene. Lobsters
which had been kept in a commercial tidal pound
constructed of creosoted timber contained highly
elevated levels of benzo(a)pyrene and other carcinogenic hydrocarbons, including chrysene,
benzo(a)anthracene, benzo(b)fluoranthene,
dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.
The maximum level of benzo(a)pyrene was 2300 the maximum level of benzo(a)pyrene was 2300 nannog/g wet weight in digestive gland, and 281 nannog/g in edible tail meat. These levels are substantially higher than previously reported for

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants-Group 5A

any foodstuff, and are most probably attributable to creosote contamination during impoundment.

(Deal-EIS)

ASSIMILATION EFFICIENCY OF DIETARY METHYLMERCURY BY NORTHERN PIKE

(ESOX LUCIUS),
Montana State Univ., Bozeman. Dept. of Biology.
G. R. Phillips, and R. W. Gregory.
Journal of the Fisheries Research Board of Canada, Vol 36, p 1516-1519, 1979. 2 Tab, 19 Ref.

Descriptors: *Mercury, *Path of pollutants, *Pikes, Carp, Predation, Growth stages, Fish physiology, Trophic level, Heavy metals, Fish diets, *Tissue analysis, *Bioaccumulation, *Meth-

Northern pike (Esox lucius) retained an average of 19% (range 6-31%) of the methylmercury which they ingested during consumption of young-of-theyear carp (Cyprinus carpio) collected from a pond; carp accumulated methylmercury naturally while in the pond. The total amount of mercury in pike m the pond. The total amount of mercury in pike increased with time (up to 42d) but concentration in the tissue decreased due to growth dilution; duration of ingestion did not influence efficiency of methylmercury assimilation. This value (19%) is considerably lower than most efficiencies reported in the literature, demonstrating that methylmercury in this forage fish is less readily available to a predator fish than previous studies implied. (Deal-EIS) W80-03253

WAX ESTERS IN THE MARINE ENVIRON-MENT: ORIGIN AND COMPOSITION OF THE WAX FROM BUTE INLET, BRITISH COLUM-

Skidaway Inst. of Oceanography, Savannah, GA. R. F. Lee, and J. C. Nevenzel. Journal of the Fisheries Research Board of Canada, Vol 36, p 1519-1523, 1979. 2 Tab, 29 Ref.

Descriptors: *Copepods, *Pollutant identification, Pescriptors. Copepous, Fortutain inentification, Elipids, Organic compounds, Chemical analysis, Chromatography, Animal physiology, Biochemistry, Mortality, Seasonal, Winter, Zooplankton, Bute Inlet, British Columbia, *Wax esters.

During severe winters large amounts of a solid During severe winters large amounts of a soint lipid accumulate on the water surface and on the shores of Bute Inlet, a deep fjord on the mainland of British Columbia. Chromatographic analyses show that this wax consists chiefly of wax esters (48%), with minor amounts of hydrocarbons (4%) and triacylglycerols (6%). Dominant among the zooplankton in this inlet is the copepod Calanus and thacylgiveois (0%). Softmant annual meter cooplankton in this inlet is the copepod Calanus plumchrus, which also is rich in wax esters (40-50% of dry weight). Except for the lack of polyunsaturation in Bute Inlet wax there is a close similarity between the wax ester, alcohol, and fatty acid compositions of C. plumchrus and Bute Inlet wax. The major hydrocarbon of both is pristane. We hypothesize that Bute Inlet wax is produced by some major change in water conditions which cause a massive kill of copepods. At winter temperatures this lipid is a solid and as such may accumulate on the beach. Copepods are the likely source for the wax esters in slicks and sediments reported from oceanic areas throughout the world. (Deal-EIS)

ACCUMULATION AND EXCRETION OF 95ZR AND 95NB BY COMMON GOBY (ACANTHO-GOBIUS FLAVIMANUS),

National Inst. of Radiological Sciences, Nakaminato (Japan). Div. of Marine Radioecology. Y. Suzuki, M. Nakahara, and T. Ueda. Bulletin of the Japanese Society of Scientific Fisheries, Vol 45, No 10, p 1293-1298, 1979. 7 Fig, 2 Tab, 20 Ref.

Descriptors: *Radioisotopes, *Absorption, *Marine fish, Radiochemical analysis, Tracers, Path of pollutants, Fish physiology, Animal metabolism, Fallout, Radioactive wastes, Nuclear powerplants, *Bioaccumulation, *Tissue analysis, *De-

puration, *Goby-fish, *Niobium radioisotopes, Zirconium radioisotopes.

In order to gain more information on 95Zr and 95Nb accumulation and excretion by marine fish, a laboratory study was undertaken using common goby. Radioactivity of 95Zr and 95Nb in the tissues or organs was simultaneously measured and readily distinguished by a high resolution detector. More than 60% of both total body burden of 95Zr and 95Nb was concentrated in the viscera (mainly disestive tracts) in smite of the small weight per digestive tracts) in spite of the small weight per cent (1.3%). The concentration factors of 95Zr and 95Nb on the 14th day after exposure were 34 and 42 for viscera; however, those were estimated to reach 70 and 83, respectively, if the fish were reared for a month under a constant level of radioactivity in sea water. The turnover rate for viscera was 0.0081 for 95Zr and 0.0018 for 95Nb, and the biological half-life was 85 days for 95Zr and 385 days for 95Nb, respectively. (Deal-EIS)

T. L. Shaw.

New Zealand Journal of Marine and Freshwater Research, Vol 13, No 3, p 393-394, 1979. 1 Tab, 4

Descriptors: *Bioindicators, *Rainbow trout, *Chemical wastes, Copper compounds, Poisons, Monitoring, Mortality, Water quality, Fish physiology, Animal metabolism, Fish behavior, Analytchniques, *Cyanides.

Median survival, 10% mortality, and 10% turn-over times of rainbow trout, Salmo gairdneri Richardson, were compared in solutions containing copper or cyanide ions. For all concentrations of poisons (0.5, 1.0, and 2.0 g/cubic meter of copper as Cu2+ and 0.3, 0.5, 1.0, and 5.0 g/cubic meter of cyanide, as KCN), the times for turnover were the cyanide, as KCN), the times for turnover were the least. These were short enough (4.5-96 min) to be of use in monitoring waters which are being abstracted by water treatment plants. The method may be generally applicable for detection of gross forms of pollution by hazardous chemicals. (Deal-EYS) W80-03257

INDICATORS OF PHOSPHORUS AND NITROGEN DEFICIENCY IN FIVE ALGAE IN

Department of Fisheries and Marine Services. Department of Fisheries and Marine Services, Winnipeg (Manitoba). Freshwater Inst. F. P. Healey, and L. L. Hendzel. Journal of the Fisheries Research Board of Canada, Vol 36, No 11, p 1364-1369, 1979. 7 Fig.

Descriptors: *Aquatic algae, *Nutrient requirements, *Bioindicators, Phosphorus, *Nitrogen, Nutrients, Absorption, Chlamydomonas, Scenedesmus, Anabaena, Chlorophyta, Cyanophyta, Metabolism, Proteins, Carbohydrates, Biochemistry, En-

Five freshwater algae (Chlamydomonas reinhardi, Scenedesmus quadricauda, Anabaena variabilis, Pseudoanabaena catenata, and Cryptomonas erosa) were grown in baich culture without nutrient limi tation and with various degrees of P and N limita-tion. They were analysed for several aspects of composition and some metabolic activities of po-tential use as indicators of nutrient deficiency to tential use as indicators of nutrient deficiency to a did not stablishing values indicative of the presence of absence of nutrient deficiency. Ratios of N/C, P/C, N/P, protein/C, carbohydrate/C, and protein/carbohydrate most clearly differentiated between no, P, and N deficiency. The initial saturated rate of phosphate uptake, P debt, and alkaline phosphatase activity increased distinctly in P deficiency in some of the algae but not in others. Similarly, the initial saturated rate of ammonium uptake and N debt rose in some but not all N-deficient algae. Cryptomonas erosa tended to form walled resting cells (cysts) during growth into P or N deficiency. (Deal-EIS)

W80-03258

PCBS AND DDE IN COMMERCIAL FISH

PEEDS, National Marine Fisheries Service, Ann Arbor, M.I. Great Lakes Fishery Lab.
M. J. Mac, L. W. Nicholson, and C. A. McCauley.
The Progressive Fish Culturist, Vol 41, No 4, p 210-211, 1979. 1 Tab, 6 Ref.

Descriptors: *Pesticide residues, *Fish diets, *Fish food organisms, DDE, Polychlorinated biphenyls, Brine shrimp, Aroclors, Chlorinated hydrocarbon pesticides, Gas chromatography, Path of pollutants, Fish hatcheries, *Commercial fish feeds.

Three commercial fish feeds were analyzed for PCBs and p.p/DDE and were reported in dry weight concentrations. In various sizes of Oregon Moist Pellets, concentrations of PCBs ranged from Moist Pellets, concentrations of PCBs ranged from less than 0.10 to 0.30 microg/g and those of p.p'DDE from less than 0.01 to 0.47 microg/g. In Silver Cup, concentrations of PCBs were 0.06 to 0.07 microg/g, and p.p'DDE, 0.01 to 0.06 microg/g. Nauplii of brine shrimp (Artemia salina) contained 0.14 microg/g PCB and 0.03 microg/g p.p'DDE. (Deal-EIS) W80-03259

UPTAKE OF HYDROCARBONS BY THE MARINE DIATOM CYCLOTELLA CRYPTICA, University Coll. of North Wales, Menai Bridge. Marine Science Labs.

M. Karydis. Microbial Ecology, Vol 5, p 287-293, 1980. 3 Fig, 3 Tab, 22 Ref.

Descriptors: *Diatoms, *Absorption, *Oil, Cytological studies, Marine algae, Metabolism, Chemical analysis, Gas chromatography, Organic compounds, Aromatic compounds, Phytoplankton, *Bioaccumulation, *Paraflins, *Alkanes.

The accumulation of exogenous hydrocarbons by the marine diatom Cyclotella cryptica grown in culture has been studied using gas chromatography. Exposure of the alga to paraffins for 10 days results in accumulation of n-alkanes having between C13 and C16 carbon atoms. The C16 level in the accumulated fraction is twice as high as that in the original oil. (Deal-EIS) W80-03267

PRELIMINARY RESULTS ON UPTAKE AND ELIMINATION AT DIFFERENT TEMPERATURES OF P.P'-DDT AND TWO CHLOROBI-PHENYLS IN PERCH FROM BRACKISH

WATER, National Swedish Environment Protection Board, Stockholm. Research Lab. M. Edgren, M. Olsson, and L. Renberg. Amblo, Vol 8, No 6, p 270-272, 1979. 2 Fig, 2 Tab,

Descriptors: *Cooling waters, *Pesticide kinetics, *Fish physiology, Absorption, *DDT, *Polychlo-rinated biphenyls, Chlorinated hydrocarbon pesti-cides, Pesticide residues, Perches, Water tempera-ture, Nuclear powerplants, Path of pollutants, *Bioaccumulation, *Tissue analysis.

Cooling water discharged by nuclear power plants usually causes a local temperature rise of up to 10C in the recipient water body. This study investigated how such a temperature increase influences the accumulation and elimination of p,p'-DDT and two chlorobiphenyls chosen as representative for PCBs in perch (Perca fluviatilis) at various water temperatures. In the accumulation experiment a temperature difference of 10C resulted in doubled concentrations of the studied chlorinated hydro-carbons. In the elimination experiment, concentrations of the chlorinated hydrocarbons decreased after one week of recovery, but no significant difference in their elimination was observed among difference in their elimination was observed among fish kept at different temperatures. However, the three organochlorines studied showed different elimination rates. The preliminary results indicate that the bioaccumulation of DDT and PCB increases in fish living in a cooling water recipient.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A-Identification Of Pollutants

HEAVY METALS (HG, CD, CU, PB, ZN) IN LIVER AND MUSCLE TISSUE OF FRESH-WATER PERCH (PERCA FLUVIATILIS) OF THE LAKE OF BIEL AND THE WALENSEE

(IN GERMAN), Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich

(Switzerland). V. H.-R. Hegi, and W. Geiger. Schweizerische Zeitschrift für Hydrobiologie, Vol 21, No 1, p 94-107, 1979. 12 Tab, 19 Ref.

Descriptors: "Heavy metals, "Lakes, "Perches, "Mercury, "Lead, "Copper, "Cadmium, "Zinc, Chemical analysis, Fish physiology, Animal metabolism, Water quality standards, "Tissue analysis, *Liver, *Muscle

Liver and muscle tissue from fish caught between Liver and muscle tissue from fish caught between 1973 and 1975 in two Swiss lakes, namely the Lake of Biel and the Walensee, were analyzed for the heavy metals Hg, Cd, Cu, Pb and Zn. The research project was carried out within the framework of an international OECD program. The comparison of metal concentrations in fish originating from the two lakes revealed for the Lake of Biel higher Hg. values throughout and higher Cu and Zn values in the livers, whereas for the Walensee the Cd values the livers, whereas for the Walensee the Cd values were formed to be higher in the livers. The Pb concentrations did not differ significantly. With regard to the examined organs (livers and muscles) the comparison showed higher Hg concentrations in the muscles than in the livers. The Cd, Cu, Pb and Zn concentrations, however, were found to be higher in the livers. Not a single fish sample exceeded Switzerland's admissible tolerance level for Hg, namely 0.5 mg/kg in fish meat. (Deal-EIS) W80-03269

PURIFICATION AND PROPERTIES OF SOLU-BLE ARYLSULPHATASES ISOLATED FROM HEPATOPANCREAS OF THE SHRIMP CRAN-GON CRANGON L.

Akademia Medyczna, Gdansk (Poland). Dept. of

G. Drewa, T. Dabrowska, Z. Zbytniewski, and F.

Kieler Meeresforschungen, Vol 4, p 360-365, 1978. 2 Fig, 4 Tab, 6 Ref.

Descriptors: *Enzymes, *Inhibition, *Detergents, *Shrimp, Animal metabolism, Animal physiology, Biochemistry, Oil, Fuels, Surfactants, Chromatography, Chemical properties, Mode of action, *Tissue analysis, *Arysulphatases.

Arylsulphatase A and B were isolated from the hepatopancreas of the shrimp Crangon crangon L after 7 days incubation in 50 ppm of detergent 'SOLO'. Arylsulphatase A,B-l and B-2 were isolated from the hepatopancreas of the shrimp C. crangon L. incubated in pure brackish water (salinity 7 0/00). Heavy and light fuel oil added to the o/oo). Heavy and light fuel oil added to the enzyme in vitro in concentrations of 2.0% inhibit the activity of arylsulphatase A to a greater degree than arylsulphatase B (14.4% and 3.5% respective-than arylsulphatase B (10.0° (mixture of nonionic and anionic detergents) in the concentrations of 0.5% arylsulphatase A and for 91% arylsulphatase B, whereas in concentrations of 2.0% it inhibits arylsulphatase A for 91.7% and arylsulphatase B for 100%. (Deal-EIS)

ISOLATION AND ELEMENTAL ANALYSIS OF METAL-RICH GRANULES FROM THE KIDNEY OF THE SCALLOP, PECTEN MAXI-MUS (L.),

Natural Environment Research Council, Aberdeen (Scotland). Inst. of Marine Biochemistry.
S. G. George, B. J. S. Pirie, and T. L. Combs.
Journal of Experimental Marine Biology and Ecology, Vol 42, p 143-156, 1980. 5 Fig. 4 Tab, 21 Ref.

UMI

Descriptors: *Metals, *Cytological studies, Animal metabolism, Calcium, *Manganese, *Zinc, *Phosphorus, *Magnesium, *Copper, *Iron, *Cadmium, Potassium, *Sulfur, Chlorine, Chemical analysis,

Electron microscopy, Biological membranes, Animal physiology, Path of pollutants, *Pecten, *Scallops, *Tissue analysis, *Kidney.

Excretory granules from the kidney of the scallop, Pecten maximus (L.), have been isolated and purified. Their morphology has been determined by electron microscopy and their elemental composielectron microscopy and their elemental composi-tion by electron-probe X-ray micro-analysis. The granules, varying in size from 5-15 um diameter, are inorganic in nature and contain Ca, Mn, Zn, and P, equivalent to 75% of their dry weight, with Mg, Cu, Fe, Cd, K, S, and Cl also present in much smaller amounts. The granules show large vari-ations in elemental composition but the sum of the metals is always close to equimolarity with the phosphorus content. Electron microscopy of the kidney tissue showed that there is a gradual devel-opment of the granules from lysosomal membra-nous vesicles to highly mineralized membrane-lim-ited vacuoles or residual bodies, which are eventu-ally excreted as such into the urinary tract. (Deal-EIS)

EFFECT OF LONG-TERM LEAD EXPOSURE ON THE SEAWATER AND SEDIMENT BAC-TERIA FROM HETEROGENEOUS CONTINU-

OUS FLOW CULTURES, Institut fuer Meeresforschung, Bremerhaven (Germany, F.R.). Dept. of Bacteriology. T. L. Tan.

Microbial Ecology, Vol 5, p 295-311, 1980. 6 Fig, 6

Descriptors: *Lead, *Bacteria, *Toxicity, *Growth rates, Heavy metals, Resistance, Marine bacteria, Seawater, Absorption, Sediments, Aerobic bacte-ria, Anaerobic bacteria, Azotobacter, Nitrogen fixing bacteria, Adaptation

Lead-influenced changes of the composition of seawater and sediment bacteria were studied in two flow cultures run with lead-contaminated artificial seawater (1 mg Pb2+/1) and one control culture. During the experiment viable counts of physiological groups of bacteria from the control culture were not significantly different from that of the lead-contaminated cultures. Lead tolerance of seawater and sediment bacteria strains was investigated. Comparisons of grouph yields showed the gated. Comparisons of growth yields showed that lead tolerance of seawater and sediment bacteria was lost again if the bacteria were cultivated in a medium without lead. Lead tolerance could not be demonstrated for the sediment bacteria of one leaddemonstrated for the sediment bacteria of one lead-contaminated culture. Heterotrophic uptake mea-surements with radioactive glucose indicated that seawater bacteria from the lead-contaminated cul-tures adapted to lead pollution. The sediment bac-teria, however, did not reveal lead tolerance by this method. Fluctuations in lead content of the sediment as well as of the overlying seawater gave indications of adsorption-desorption processes between seawater and sediment. Lead was not homogeneously distributed at the sediment surface. (Deal-EIS)

CONCENTRATIONS OF ARSENIC, SELENI-UM AND TEN HEAVY METALS IN SCHOOL SHARK, GALEORHINUS AUSTRALIS (MA-CLEAY), AND GUMMY SHARK, MUSTELUS ANTARCTICUS GUNTHER, FROM SOUTH-EASTERN AUSTRALIAN WATERS,

Victoria Dept. of Agriculture, Melbourne (Australin). J. W. Glover.

Australian Journal of Marine and Freshwater Research, Vol 30, p 505-510, 1979. 1 Tab, 13 Ref.

Descriptors: "Sharks, "Heavy metals, "Baseline studies, "Cadmium, "Copper, "Manganese, "Zinc, "Cobalt, "Chromium, "Lead, "Nickel, "Molybdenum, Path of pollutants, Chemical analysis, Spectrophotometry, "Arsenic, "Selenium, "Tissue analysis "Shioacompulstion" vsis. *Bioaccu

The maximum concentrations of arsenic, cadmium copper, manganese, selenium and zinc in the edible flesh of G. australis and M. antarcticus were found to be 30, 0.08, 0.6, 0.8 and 4.8 micro/g, wet weight

respectively. The concentrations of cobalt, chromium, lead, molybdenum and nickel were below the limits of detection, namely 0.3, 0.5, 0.1, 0.2 and 0.2 and 0.2 and 0.5 and 0.

COMBINED EFFECTS OF CADMIUM, COPPER AND LEAD ON DEVELOPING HER-RING EGGS AND LARVAE, Biologische Anstalt Helgoland, Hamburg (Ger-many, F.R.). H. V. Westernhagen, V. Dethlefsen, and H.

wissenschaftliche Meeresuntersuchungen, Vol 32, p 257-278, 1979. 11 Fig, 5 Tab, 23 Ref.

Descriptors: *Fish eggs, *Toxicity, *Heavy metals, *Cadmium, *Copper, *Lead, Larval growth stage, Embryonic growth stage, Herrings, Mortality, Absorption, Path of pollutants, *Bioaccumulation,

Eggs of Baltic herring were incubated (10C; 16 o/ oo S) in sea water containing mixtures of Cd, Cu and Pb at concentrations of 0.56 - 5.0, 0.0167 - 0.15, 0.56 - 5.0 mg metal.). Embryonic survival until hatching, viable hatch and uptake of metals by embryos and early larvae were measured. Negative effects of metals on embryonic survival and viable hatch were additive in the case of Cu and Cd. Pb did not exert detrimental effects. Untake of metals of metals of the control of the cont did not exert detrimental effects. Uptake of metals with exposure time was non-linear in eggs and linear in larvae. Total uptake of Cu and Cd by eggs was subjected to antagonistic or spregistic action of the other two metals present. Accumulation of Pb by eggs was enhanced when Cu was also present. (Deal-EIS)

MERCURY, DDE, AND PCBS IN EGGS FROM A NORWEGIAN GANNET COLONY, Tromsoc Univ. (Norway). N. Fimreite, N. Kveseth, and E. M. Brevik. Bulletin of Environmental Contamination & Toxi-cology, Vol 24, p 142-144, 1980. 1 Tab, 14 Ref.

Descriptors: *Mercury, *Pesticide residues, *Bird eggs, DDE, Polychlorinated biphenyls, Heavy metals, Water birds, Pesticide kinetics, Path of pollutants, Gas chromatography, *Gannet, *Morus, *Tissue analysis.

The residues of mercury, DDE and PCBs in sea-bird eggs sampled in 1972 were compared to simi-lar analyses in 1978. The average total mercury level increased from 0.58 to 0.80 ppm between 1972 and 1978. In contrast to mercury, the DDE and PCB levels decreased substantially in the same period, from 2.1 to 0.66 and from 7.7 to 3.5 ppm, respectively. The mercury was composed almost entirely of methylmercury. (Deal-EIS) W80-03288

TOXIC EFFECTS OF THE PHYTOALKALOID COLCHICINE ON OVIPOSITION AND NEUR-OSECRETION OF THE VECTOR SNAIL (INDOPLANORBIS EXUSTUS), Marathwada Univ., Aurangabad, (India). Dept. of

Zoology. M. M. Hanumante, D. P. Vaidya, and R.

Nagabhushanam.

Bulletin of Environmental Contamination & Toxicology, Vol 24, p 37-39, 1980. 1 Tab, 7 Ref.

Descriptors: *Pesticide toxicity, *Gastropods, *Molluscicides, Animal parasites, Vectors(Biological), Trematodes, Worms, Mode of action, Reproduction, Inhibition, Fertility, Public health, *Colchicine.

Chemical control of freshwater gastropods that transmit trematode parasites is still the most promising method of curbing snail-borne diseases. This

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants-Group 5A

study examines the effectiveness of colchicine in disrupting reproduction in the snail (Indoplanorbis exustus). At sublethal concentrations (10 ppm) colchicine had critical effects at both behavioral (oviposition) and cellular (neurosecretory) levels. Effects were also noted in the structure and number of eggs laid, significantly decreasing fertility. The specific cellular types and functions effected are also discussed. (Deal-EIS) W80-03289

IDENTIFICATION OF CHLORDANES AND RELATED COMPOUNDS IN GOBY-FISH FROM TOKYO BAY,
Tokyo Metropolitan Research Lab. of Public

Health (Japan). T. Miyazaki, K. Akiyama, S. Horii, and T.

Yamagishi.

Bulletin of Environmental Contamination & Toxicilogy, Vol 24, p 1-8, 1980, 5 Fig, 2 Tab, 14 Ref.

Descriptors: *Pollutant identification, *Pesticide residues, *Marine fish, Pesticide kinetics, *Chlorinated hydrocarbon pesticide, Heptachlor, Gas chromatography, Path of pollutants, Chemical properties, Bioindicators, *Nonachlor, *Chlordane, *Japan, *Goby-fish, *Tissue analysis.

We recently reported that trans-nonachlor had been identified in gaby-fish collected from Tokyo Bay. The detection of this compound in fauna suggested environmental pollution by chlordane suggested environmental pollution by chlordane and/or heptachlor, because trans-nonachlor is one of the constituents of technical chlordane and tech-nical heptachlor. The goby-fish samples known have been intensively examined. Four unknown peaks were found in the fractions of organochlor-ine pesticides. The unknowns were identified as oxychlordane, trans and cis-chlordanes and cisonachlor by gas chromatography-mass spectrom-etry. These compounds have not been previously identified in environmental biota in Japan, while detected only in U.S.A. (Deal-EIS) W80-03290

EFFECTS OF P,P'-DDT, P,P'-DDD, AND P,P'-DDE ON OXYGEN UPTAKE IN THE FRESH-WATER PLANARIAN (PHAGOGATA GRACI-

LIS),
Middle Tennessee State Univ., Murfreesboro.
B. H. Batey, and M. R. Wells.
Bulletin of Environmental Contamination & Toxicology, Vol 24, p 128-133, 1980. 4 Tab, 5 Ref.

Descriptors: *Pesticide toxicity, *Oxygen requirements, *Worms, *DDT, DDD, DDE, *Chlorinated hydrocarbon pesticides, Toxicity, Mode of action, Oxygen demand, Animal metabolism, Enzymes, Biodegradation, *Planarians, *Phagocata, *Bioaccumulation.

The toxicity of DDT and two of its metabolites (DDD and DDE), as measured by oxygen uptake, was studied in the freshwater planarian, Phagocata gracilis. The data presented indicate that 60-min exposure of P. gracilis to beef liver perfused with 10 ppm of p.p.*DDT, p.p.*DDD, or p.p.*DDE in corn oil was not toxic to this species. It is possible, therefore, that P. gracilis possessesses a microsomal enzyme system capable of degrading DDT into DDD and DDE by reductive dechlorination and dehydrochlorination, respectively. It is also condehydrochlorination, respectively. It is also con-ceivable that P. gracilis failed to accumulate within 60 min sufficient amounts of DDT, DDD, or DDE to toxic effects. Longer exposure of P. gracilis to DDT and its metabolites could perhaps result in the buildup of dangerously toxic levels in its adipose tissue. (Deal-EIS) W80-03291

A POSSIBLE PHYSIOLOGICAL UPTAKE MECHANISM OF METHYLMERCURY BY THE MARINE BLOODWORM (GLYCERA DI-

BRANCHIATA), Illinois State Univ., Normal. Dept. of Biological

D. M. Medeiros, L. L. Cadwell, and R. L. Preston. Bulletin of Environmental Contamination & Toxi-cology, Vol 24, p 97-101, 1980. 2 Fig, 1 Tab, 13 Ref.

Descriptors: *Mercury, *Worms, *Absorption, Chemical properties, Chemical reactions, Path of pollutants, Heavy metals, Radiochemical analysis, Tracers, Membrane processes, Animal metabolism, *Depuration, *Tissue analysis, *Methylmercury.

The objective of this paper is to examine the uptake mechanism of methyl-mercury from water in a lower-food-chain organism, the marine bloodworm (Glycera dibranchiata). Whole bloodworms worm (Glycera dibranchiata). Whole bloodworms were exposed to 10 ppb 203Hg for 4 days and monitored at regular intervals by a scintillation detector. Elimination of 203Hg after a half-hour exposure was also studied. Initial uptake of mercury was extremely rapid (60 ppb within the first 10 h as compared to 80 ppb for 80 h.). Elimination was also extremely rapid in the initial phase. In a sea water medium the final (8h.) concentration was sill 70% of original mercury content. In a cysteine medium the final mercury content was less than 20% of the original. Various mechanisms for membrane uptake of mercury are discussed. (Deal-EIS) W80-03293

SELENIUM TOXICITY TO DAPHNIA MAGNA, HYALLELA AZTECA, AND THE FATHEAD MINNOW IN HARD WATER, Michigan State Univ., East Lansing. Pesticide Research Center.

M. T. Halter, W. J. Adams, and H. E. Johnson. Bulletin of Environmental Contamination & Toxicology, Vol 24, p 102-107, 1980. 1 Fig. 2 Tab, 23

Descriptors: "Toxicity, "Metals, "Daphnia, "Minnows, Bioassay, Hardness(Water), Mortality, Lethal limit, Amphipoda, Animal physiology, Fish physiology, Fertility, "Selenium," Hyallela fathead

This is a report on the comparative toxicity of selenium to three common representatives of the warm-water biota, Daphnia magna, Hyallela atteca, and the fathead minnow (Pimephales promelas). Selenium concentrations above about 0.5 mg/l were lethal to daphnia within 96h, but at lower concentrations toxicity declined sharply. H. azteca were killed by selenium levels above about 0.5 mg/l for 96h. Continued exposure at lower selenium concentrations produced additional mortalities. Mortalities of fathead minnow fry occurred at all selenium levels tested, from 0.35 to 1.4 mg/l. Se. Daphnia was the most sensitive species initially at all selenium levels tested, from 0.35 to 1.4 mg/l Se. Daphnia was the most sensitive species initially but the least sensitive putintely. Amphipods were the most sensitive species after 336n (two weeks) of exposure, but further effects apparently could be expected under continued exposure for both am-phipods and fish. The threshold reaction time or induction period of selenium toxicity, as seen at higher selenium levels, for fish was at least double that measured for invertebrates. (Deal-EIS)

HEAVY METALS IN THE SEDIMENTS OF THE GULF OF BOTHNIA,

Stockholm Univ. (Sweden). Dept. of Geology. R. O. Hallberg. Ambio, Vol 8, No 6, p 265-269, 1979. 4 Fig, 6 Tab,

Descriptors: "Heavy metals, "Sediments, "Path of pollutants, Industrial wastes, "Nickel, "Manganese, "Cobalt, "Molybdenum, "Cadmium, "Zinc, 'Iron, "Copper, "Lead, "Mercury, Water chemistry, Water pollution sources, Bottom sediments, "Arsenic, "Vanadium.

The Baltic Sea has been severely contaminated with metals since the beginning of this century. This study reports on an examination of heavy metal sediment and tributary river chemistry in the northern part of the Baltic Sea--the Gulf of Both-nia. The Gulf was found to be highly polluted with heavy metals, especially arsenic, lead and mercury. Rivers constituted the primary pathways of metals to the Gulf. Because the metal content of the sediments does not correlate to the river loadings this probably indicates that large amounts of metals are transported south to the Baltic proper. (Deal-EIS) /80-03295

HYDROIDS IN BIOTEST: CLAVA MULTICOR-NIS EXPOSED TO CADMIUM.

Kiel Univ. (Germany, F.R.). Inst fuer Meeres

Kieler Meeresforschungen, Vol 4, p 327-334, 1978. 2 Fig, 1 Tab, 27 Ref.

Descriptors: "Cadmium, "Toxicity, "Water temperature, Bioassay, Salinity, Predation, Animal behavior, Heavy metals, Mortality, Bioindicators, "Hydroids, "Clava, "Hydrozoa.

*Hydroids, *Clava, *Hydrozoa.

The influence of different temperatures and salinities on the toxicity of cadmium has been studied in short- and long-term experiments, using the colonial hydroid Clava multicornis as test organism. Clones were subcultured under prospective T/Stest conditions, applying 12 1 recirculating seawater systems with biological water conditioning, glass plates for substratum, and Artemia nau-pili for food. The inability of C. multicornis to catch and swallow prey induced by heavy metals was chosen as lethal criterion. High temperature and low salinity within the ecological range of the species increased the acute toxicity of cadium, while low temperature and high salinity enabled C. multicornis to resist higher metal concentrations in the water or delayed the appearance of reactions on pollution, respectively. The long-term sublethal threshold concentration of some 200 microg Cd/I was not affected by combinations of temperature from 5 to 20°C and salinity from 10 to 25 o/oo. (Deal-EIS)

W80-03296

TOXIC EFFECTS AND ACCUMULATION OF CADMIUM IN SOME BENTHIC ORGANISMS OF THE BALTIC,

Kiel Univ. (Germany, F.R.). Inst. fuer Meeres-

N. Scholz, H. Fischer, and H. Theede. Kieler Meeresforschungen, Vol 4, p 317-326, 1978. 4 Fig. 24 Ref.

Descriptors: *Cadmium, *Toxicity, *Benthic fauna, Water temperature, Salinity, Mollusks, Mussels, Heavy metals, Animal physiology, Animal metabolism, Path of pollutants, Mode of action, Enzymes, Inhibition, Biochemistry, Proteins, *Hydrozoa, *Clavis, *Laomedea, *Tissue analysis, *Bioaccumulation, *Baltic Sea.

In coastal areas or estuaries cadmium content of water and sediments may be distinctly increased. The acute toxicity of Cd to sensitive organisms is strongly modified by environmental factor combinations occuring in the Baltic. In comparison with other species and developmental stages, up to the present, Loamedea loveni proved to be the most sensitive test species to Cd. Within the ecological range the sensitivity to Cd increases with higher temperatures and lower salinities. Under these conditions not only is the rate of accumulation of Cd enhanced, but the protroplasmic sensitivity is inditions not only is the rate of accumulation of Cd enhanced, but the protoplasmic sensitivity is increased to internal metal concentration. In long-term experiments with Clava multicornis the modifying effect of temperature and salinity decreases during the course of some weeks. Contrary to enidarians, many molluscs are able to accumulate high concentrations of Cd without signs of physiological damage. In many places in the Western Baltic the levels of Cd in Mytilus edulis are higher than in comparable individuals from localities on the North Sea coast. There are also correlations of Cd content of mussels with depth of their locality, size, and season. Of the mussels organs, digestive diverticula and kidney greatly accumulate the metal. Preliminary results with ion exchange, and gel filtration chromatography of the mussel's proteins, suggest the occurrence of special Cd-binding proteins, e.g. in the hepstopancreas, as a main proteins, e.g. in the hepatopancreas, as a main reason for the high tolerance of M. edulis to cad-mium. (Deal-EIS) W80-03297

REVIEW OF EXPERIMENTS ON THE CHRONIC TOXICITY EXERTED BY SOME POLLUTANTS ON ANIMAL SPECIES FROM THE BAY OF GDANSK,
Akademia Medyczna, Gdansk (Poland). Dept. of

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

Biology. F. Pautsch. Kieler Meeresforschungen, Vol 4, p 335-359, 1978. 22 Fig. 2 Tab, 26 Ref.

Descriptors: *Toxicity, *Detergents, *Oil, *Phosphorus compounds, Fuels, Oil pollution, Surfactants, Fertilizers, Chemical wastes, Shrimp, Crabs, Carp, Pikes, Perches, Animal metabolism, Enzymes, Reproduction, Growth stages, Animal growth, Mode of action, *Crude oil, *Dispersants, *Phosphogypsum.

The subject of the experimental investigations is the effects of chronic toxicity exerted by the following pollutants of industrial origin on some animals from the Bay of Gdansk: (1) phosphogypsum; (2) some detergents, i.e. a commercial product 'So-LO', a mixture of nonionic and anionic surfactants (for household purposes), and an oil-spill remover Gamlen 'CW' Solvent; (3) crude Kuwait oil and one of its derivatives, fuel oil No. III. The experimental animals are: Crangon crangon L.. Rhitbromental simulas are: Crangon crangon L. one of its derivatives, fuel oil No. III. The experimental animals are: Crangon crangon L., Rhithropanopeus harrisi (Gould), the crucial carp (Carasius carassius L.), the pike (Esox lucius L.) and the perch (Perca fluviatilis L). The pollutants mentioned above induce sublethal changes in the enzymic system; reproductive activity; and embryonic and larval development. Additionally, degenerative changes in the ultrastructure of crustacean brain and pathological disturbances in function and structure of isolated mitochondria could be observed. orani and partitioning and a structure of isolated mitochondria could be observed. The general conclusion is that chronic sublethal toxicity may severely affect or even destroy some marine ecosystems. (Deal-EIS) W80-03298

5B. Sources Of Pollution

ZINC IN THE CONWY RIVER AND ESTUARY. Leeds Univ. (England). Dept. of Earth Sciences For primary bibliographic entry see Field 2L. W80-03029

THEORETICAL AND EXPERIMENTAL STUDY OF WIND- AND WAVE-INDUCED

Shell Development Co., Houston, TX.

D. T. Tsahalis

JMI

Journal of Physical Oceanography, Vol 9, No 6, p 1243-1257, November 1979, 13 Fig, 5 Tab, 28 Ref.

Descriptors: "Aquatic drift, "Oil spills, "Laboratory tests, "Theoretical analysis, Model studies, Mathematical models, Winds, Velocity, Shear, Waves(Water), Pollutants, Water pollution, Path of pollutants, Oceans, Oceanography, Surface drift.

A study was carried out on the surface drift on open water due to the combined action of currents, winds, and wind-generated waves for cocurrent and countercurrent airflow. It was shown theoretically that the nondimensional groups necessary for the modeling of the surface drift are (T - c)/c and U sub 10/c, where U sub 10, T, and c are the wind, water surface, and current velocities, respectively, the wind being measured at the uniquely adopted height of 10 m. Surface drift experiments, carried out in a current tank/wind tunnel, verified the dependence on the above groups and led to the derivation of relationships for the calculation of the total surface drift. The surface drifts, calculated from the above exhibition that the surface drifts are allowed. from the above relationships, were in excellent agreement with available field and laboratory data. These results supported Charnock's expression re-These results supported Charnock's expression re-lating the surface roughness and shear velocity for completely rough flow due to gravity waves and Wu's Froude number scaling of wind-stress coeffi-cients. Furthermore, these results showed that wind-generated waves generally cause a net de-crease or increase of the surface drift for cocurrent and countercurrent airflow, respectively. Finally, laws were formulated for the scaling of current ank/wind tunnel data for wind velocities and sig-nificant wave heights to prototype (atmospheric boundary layer) conditions. (Sims-ISWS) W80-03031 W80-03031

THE IMPACTS OF COAL STRIP MINING ON THE HYDROGEOLOGIC SYSTEM OF THE NORTHERN GREAT PLAINS: CASE STUDY OF POTENTIAL IMPACTS ON THE NORTHERN CHEYENNE RESERVATION,

ENN CHEYENNE RESERVATION, Nevada Univ. System, Las Vegas. Water Re-sources Center. W. W. Woessner, C. B. Andrews, and T. J.

Journal of Hydrology, Vol 43, No 1/4, p 445-467, October 1979. 7 Fig, 3 Tab, 44 Ref, EPA R803566.

Descriptors: *Strip mines, *Groundwater, *Effects, *Great Plains, *Montana, Mining, Coal mines, Water quality, Dissolved solida, Aquifers, Geology, Hydrogeology, On-site investigations, Model studies, Mathematical models, Water pollution sources, Hydrology, Strip mining impact

Fifty percent of the coal production of the U.S. will be obtained from the western coal fields by 1990. The majority of this coal will be produced from large-scale strip mining of the Tertiary Fort Union and Wasatch Formations of Wyoming, Montana, and North Dakota. The rapid escalation of coal strip-mining activities in the Northern Great Plains, where groundwater is the principal source of domestic and agricultural supply, threatens to alter significantly the local and regional hydrologic regime. A study of the potential impacts of strip mining on their water resources was designed and implemented. After a basic hydrogeologic study was conducted, a hypothetical mine study site was selected for evaluation. The premining hydrologic system was defined from a study site was selected for evaluation. In Pre-mining hydrologic system was defined from a monitoring well network, aquifer testing, water-quality sampling, and stream gaging. Saturation extract and leachate analyses were conducted on cuttings of overburden from wells in the mine area, cuttings of overburden from wells in the mine area, and results were used to predict the concentration of total dissolved solids (TDS) in spoil-water discharge. Strip mining of the entire minable area would have a major impact on the regional groundwater quality and a measurable impact on the quality of the receiving stream. Analysis of projected hydrologic properties of the post-mining system indicated that water-quality impacts will last for hundreds of years. (Sims-ISWS)

THE VOLUME-AVERAGED MASS-TRANS-PORT EQUATION FOR CHEMICAL DIAGEN-ETIC MODELS,

Illinois Univ. at Urbana-Champaign. Dept. of Ge-

ology.
P. A. Domenico, and V. V. Palciauskas.
Journal of Hydrology, Vol 43, No 1/4, p 427-438,
October 1979. 1 Fig, 18 Ref.

Descriptors: *Mass transfer, *Diagenesis, *Chemicals, *Equations, *Model studies, Mathematical models, Groundwater, Groundwater movement, Pores, Pollutants, Path of pollutants, Adsorption, Solutes, Porous media, Soil water.

The mass-transfer equation as appropriate for chemical diagenesis problems was developed from the viewpoint of a divergence theorem. Specific features of the averaged equations included some well-known results, such as the structure of a diffusion coefficient in a porous sediment and the emergence of dispersion as a dominant mixing phenomenon. Other results reflected the inclusion for provisions for an upper moving boundary for accumu-lating sediments and a suggested structure for het-erogeneous reactions at phase interfaces. Specific forms for the fluxes at interfaces were determined on the basis of conceptual models of the reaction process. (Sims-ISWS)
W80-03044

TIME-DEPENDENT SORPTION ON GEO-LOGICAL MATERIALS, Nevada Univ. System, Reno. Water Resources

P. R. Fenske Journal of Hydrology, Vol 43, No 1-4, p 415-425, October 1979. 3 Fig, 3 Tab, 4 Ref.

Descriptors: *Sorption, *Radioisotopes, *Rocks, *Laboratory tests, Cesium, Groundwater,

Aquifers, Groundwater movement, Equilibrium, Velocity, Water quality, Pollutants, Path of pollutants, Gravels, Water pollution, Time-dependent sorption, Geological materials.

The transport of radionuclides through geologic materials has been predicted using the assumption that sorption on rocks along the transport path occurs instantaneously. This assumption is valid if equilibrium sorption is reached rapidly relative to groundwater velocity. Laboratory experiments with large pieces of rock and also varying particle sizes indicate that equilibrium sorption may be reached too slowly under some conditions for the assumption of instantaneous sorption to be valid. An empirical equation has been devised from the reached too slowly under some conditions for the assumption of instantaneous sorption to be valid. An empirical equation has been devised from the laboratory experiments to describe the time-dependent sorption process for 137Cs on breccia and andesite. The hypothetical example was then worked out for flow through granular materials (pebble and cobble size) and flow through fractured rocks considering a time-dependent sorption. Dispersion was not considered in this analysis. The hypothetical prediction showed that for usual groundwater velocities, transport considering time-dependent sorption is not significantly greater than transport assuming equilibrium sorption. At velocities of groundwater above 30.5 cm/hr (1 ft/hr) the effect of the time-dependent sorption term can easily be seen in the analysis. The analysis also showed that sorption during transport through fractured rocks. This is because the mass of rock/volume of water ratio is far greater in fractured materials than in granular materials. Consideration of time dependent sorption to unit of the devices with the second of time dependent sorption unit is far greater in fractured materials than in granular materials. Consideration of time dependent sorption units units of time dependent sorption units of time dependents of the devices with the second of time dependents of the devices with the second of time dependents of the devices with the second of time dependents of the devices with the second of the dependent sorption units of the devices with the second of the device with the s fractured materials than in granular materials. Consideration of time-dependent sorption will probably not increase predictive capability for radionuclide transport. (Sims-ISWS) W80-03045

DEMONSTRATION OF NONPOINT POLLU-TION ABATEMENT THROUGH IMPROVED STREET CLEANING PRACTICES, Woodward-Clyde Consultants, San Francisco,

R. Pitt.

R. Pitt. Available from the National Technical Information Service, Springfield, VA 22161 as PB80-108988, Price codes: A13 in paper copy, A01 in microfiche. Report No EPA-600/2-79-161, August 1979, 289 p, 96 Fig. 114 Tab, 57 Ref, 7 Append. S-804432.

Descriptors: *Urban runoff, *Dusts, *Pollution abatement, *Water pollution control, Water quality, Particle size, Cost-benefit analysis, Air pollution, Paving, Cost analysis, Waste water treatment, Storm drains, California, Street cleaning.

The role of street dirt in water and air pollution, and methods of reducing this source of pollution, and methods of reducing time source or pointion, are described. Sampling procedures to test street cleaning equipment performance were developed and used to determine the range of capabilities of current street cleaning equipment and to gain general information about the cost and effectiveness of various street cleaning programs. Accumulation rates for street surface particulates were measured between each street cleaner test in San JOse, California. Overall, as particle size of pollutants de-crease, concentrations increase. Also, most street cleaning equipment is more effective at removing large particles than small. Equipment tests showed that test area differences are more important to performance than differences in equipment. Types of equipment tested were: four-wheel mechanical cleaners, state-of-the-art mechanical four wheel street cleaners, and vacuum-assisted street cleaners. Smooth asphalt streets are easier to main-tain in clean state than rough streets. Pollutant mass flow characteristics of urban runoff were also studied to estimate the beneficial effects of street studied to estimate the beneficial effects of street cleaning and to compare the quality of urban runoff with sanitary waste water effluent quality. Cost and labor analyses were included for street cleaning, runoff treatment, and combined runoff and waste water treatment. Results of a study on air pollution from street dirt are also presented. (Seigler-IPA)

Sources Of Pollution-Group 5B

ASSESSING IMPACTS OF LAND MANAGE-MENT ACTIVITIES ON EROSION-RELATED NONPOINT SOURCE PROBLEMS, Oregon State Dept. of Environmental Quality, Portland.

Portana.
D. A. Rickert, and G. L. Beach.
Journal of Water Pollution Control Federation,
Vol 50, No 11, p 2439-2445, 1978. 3 Fig. 2 Tab, 8

Descriptors: *Oregon, *Stream erosion, *Nonpoint pollution, *Land management, Erosion, Water quality, Maps, Land use, Sedimentation, Watersheds(Basins), Surveys, Environmental effects, Management, Soil erosion, Land resources, Land, Environment, Forestry, Grazing, Agricul-

This paper deals with Phase II of Oregon's Section 208 water quality planning process, a detailed basin assessment project aimed at relating stream quality to both natural terrain characteristics and to land management activities within forestry, grazing, and agriculture. Its goal is to determine relative erosion potential and most suitable management activities for different terrains. The assessment emphasizes erosion and sedimentation because these are the most widespread and pervasive non-point pollution for different terrains. The assessment emphasizes erosion and sedimentation because these are the most widespread and pervasive non-point pollution problems in Oregon. Instead of collecting water quality data, the project determines stream quality through reconnaissance field surveys of channel stability and fishery habitat conditions. In contrast stability and risnery habitat conditions. In contrast to water quality parameters, these stream characteristics are more permanent. Maps and matrices show areas where erosional and depositional problems are most prevalent. In addition, plant nutrients, pesticides, and trace metals tend to move into ents, pesticides, and trace metals tend to move into streams due to attachment to sediment particles. By using erosion potential maps and impact matrices, data programs can be spatially designed to better define cause-and-effect relationships of land and water quality. As developed, the procedure can be used to determine suitability of land management activities, monitor the success of land management regulations, and set priorities for site-specific studies of land management activities. (Danovich-Wisconsin) W80-03113

DEPOSITION VELOCITY OF PHOSPHORUS-CONTAINING PARTICLES OVER SOUTHERN LAKE HURON, APRIL-OCTOBER, 1975, Michigan Univ., Ann Arbor. Great Lakes Re-

Michigan Chrys, Alla. M. L. Petel. R. Delumyea, and R. L. Petel. Atmospheric Environment, Vol 13, No 2, p 287-294, 1979. 8 Fig. 3 Tab, 18 Ref.

Descriptors: *Lake Huron, *Phosphorus, *Deposition(Sediments), *Velocity, *Mathematical models, Aerosols, Fallout, Particle size, Dusts, Model studies, Limiting factors, Mixing, Winds, Erosion, Wind erosion, Aeolian soils, Wind velocity, Atmosphere, Air circulation.

Based on samples from Lake Huron and 11 land stations collected April-October 1975, a 0.57 cm/sec deposition velocity for phosphorus-containing particles was calculated using a mixing box model. particles was calculated using a mixing box model. Phosphorus is the limiting nutrient in the Great Lakes region. Dry deposition represents an important input mechanism since all material entering the lake by this method must pass through the euphotic zone and dry deposition is a continuous process. Particle mass median diameter is 1 micro m with 10% less than 0.1 micro m in size; the most significant fraction is due to continental erosion. The ratio of downwind to upwind phosphorus contents of aerosol, C/Co, ranges 0.4-0.8; this ratio increases with increasing wind speed. The C/Co is independent of concentration which ranges 13.4-33.2 micro g/cu m. The faster the wind blows, the smaller the aerosol residence times over the lake. 33.2 micro g/cu m. The faster the wind blows, the smaller the aerosol residence times over the lake. The C/Co values were used to calculate deposition velocities for each period using a simple box model. Assumptions include: (1) constant mixing height; (2) complete sink at the bottom; (3) complete content mixing; (4) no aerosol sources in the box; (5) constant deposition velocity; and (6) wind direction knowledge. Calculated deposition velocity, 0.57 cm/sec is higher than wind tunnel data but is consistent with other field experiments. (Danovich-Wisconsin)

BENTHIC INVERTEBRATES, PERIPHYTON, AND BOTTOM MATERIAL AND THEIR TRACE-METAL CONCENTRATIONS IN SALMON CREEK BASIN, CLARK COUNTY, WASHINGTON,

Geological Survey, Portland, OR. Water Re-

A. C. White, and S. W. McKenzie. Geological Survey open-file report 79-978, 1979. 18 p, 1 Fig, 8 Tab, 20 Ref, Append.

Descriptors: *Trace elements, *Environmental effects, *Aquatic animals, *Water analysis, *Benthos, Bottom sediments, Benthic fauna, Invertebrates, Chemical analysis, Heavy metals, Physical properties, Periphyton, Evaluation, *Salmon Creek heart(WA).

In 1978, data were collected for identification and quantification of benthic invertebrates, periphyton, and bottom material and their trace-metals concen-trations from three sites in Salmon Creek basin, Wash. Metal analyses included arsenic, cadmium, chromium, copper, lead, zinc, selenium, and mercury. Physical data collected included water temcury. Physical data collected included water temperature, dissolved oxygen, pH, discharge, and size of cobbles and fine stream-bottom material. Additional chemical analyses included major constituents. Benthic invertebrate identifications were generated to the control of the company of the control of the cms. Dentitic invertebrate identifications were gen-erally taken to the generic level, with a total of 49 taxons identified and quantified. A total of 36 peri-phyton taxons were quantified and identified, gen-erally at the species level. (Woodard-USGS)

WATER-QUALITY CONDITIONS IN THE NEW RIVER, IMPERIAL COUNTY, CALIFOR-

Geological Survey, Menlo Park, CA. Water Re-J. G. Setmire.

Geological Survey Water-Resources Investigations 79-86, July 1979. 63 p, 17 Fig, 12 Tab, 15 Ref.

Descriptors: *Water pollution sources, *Organic wastes, *Water quality, *Mexico, *California, Streams, Water analysis, Dissolved oxygen, Chemical oxygen demand, Turbidity, Carbon, Evaluation, *International streamflow, *Mexico-California boundary, *New River(Calif), *Imperial Constitute California Doundary, *New River(Calif), *Imperial Constitute California Doundary, *New River(Calif), *Imperial Constitute California Doundary, *New River(Califo, *Imperial Constitute California Doundary, *New River(Califo, *Imperial Constitute California Doundary, *Imperial Constitute California Doundary, *Imperial Constitute California Doundary, *Imperial Constitute California Doundary, *Imperial Constitute California, *Imperial Cali County(Calif).

The New River, when entering the United States at Calexico, Calif., often contains materials which have the appearance of industrial and domestic have the appearance of industrial and domestic wastes. Passage of some of these materials is recognized by a sudden increase in turbidity over background levels and the presence of white particulate matter. Water samples taken during these events are usually extremely high in organic content. During a 4-day reconnaissance of water quality in May 1977, white-to-brown extremely turbid water crossed the border on three occasions. On one of these occasions, the water was intensively sampled. The total organic-carbon conceptration ranged these occasions, the water was intensively sampled. The total organic-carbon concentration ranged from 80 to 161 milligrams per liter (mg/l); dissolved organic carbon ranged from 34 to 42 mg/l, and the chemical oxygen demand was as high as 510 mg/l. River profiles showed a dissolved-oxygen sag, with the length of the zone of depressed dissolved-oxygen concentrations varying seasonally. During the summer months, dissolved-oxygen concentrations in the river were lower and the zone of depressed dissolved-oxygen concentrations. the zone of depressed dissolved-oxygen concentra-tions was longer. The largest increases in distions was longer. The largest increases in dis-solved-oxygen concentration from reaeration oc-curred at the three drop structures and the rock weir near Seeley. The effects of oxygen demanding materials crossing the border extended as far as Highway 80, 19.5 miles downstream from the in-ternational boundary at Calexico. Fish kills and anaerobic conditions were also detected as far as Highway 80. Standard bacteria indicator tests for fecal contamination showed a very high health-hazard potential near the border. (Woodard-USGS)

IMPORTANCE OF A BORDERING WETLAND FOR CHEMICAL PROPERTIES OF LAKE

Warsaw Univ. (Poland). Dept. of Hydrobiology. A. Kowalczewski.

A. Kowaiczewski. In: Proceedings: Congress in Denmark 1977, Internationale Vereinigung fur Theoretische und Angewandte Limnologie; Vol 20, Part 4, p 2182-2185, 1978. 7 Ref. OWRT A-054-CONN(8).

Descriptors: *Chemical properties, *Swamps, *Durham Pond(CT), *Nutrient transport, *Decomposing organic matter, Water properties, Hydrogen ion concentration, Lakes, Wetlands, Water quality, Carbon dioxide, Groundwater, Dissolved solids, Organic matter, Color, Conductivity, Degradation(Decomposition), Nutrients, Groundwater movement, Waste assimilative capacity.

Studies of Dunham Pond, Connecticut, a typical New England red maple-Sphagnum swamp with shrub understory and limited herb cover, show that wetlands do not act as important sinks for nutrients; however, they do accumulate dissolved colored organic substances. The first sampling station was located in a spring, middle stations in the swamp, and the last station in lake littoral areas. Water status at the last site before entering the lake reflects the sum of swamp ecosystem metabolism influences. Water after passing through the swamp innuences. Water after passing through the swamp is not significantly changed with respect to pH, conductivity, and carbon dioxide. Spring pH values vary 5.25-7.0, pH decreases through the swamp; closer to the lake, pH increases again. Carbon dioxide changes are similar to pH changes. After an initial drop, carbon dioxide continues to build un in the stream carbon dioxide concentra-After an initial drop, carbon dioxide continues to build up in the stream; carbon dioxide concentrations stay relatively high until reaching the lake. Electrical conductivity of groundwater at station 1 is relatively constant. It decreases at upper stations 2-3, then increases again in lower stream areas. High conductivity values indicate nutrient accumulation. Spring water is practically colorless; during movement through the swamp, average OD increases 3000 times. DOC content in groundwater is relatively low during the year and rarely exceeds is relatively low during the year and rarely exceeds 5 mg C/l; however, DOC increases downstream. DOC shows seasonal variations; it is high in No-wember-December and low in January-April when swamp decomposition is also low. (Danovich-Wis-

BIOCHEMICAL SIGNIFICANCE OF ARSENI-CAL POLLUTANTS IN A POTABLE WATER

SUPPLY, Rutgers - The State Univ., New Brunswick, NJ. Rutgers - The State Univ., New Brunswick Dept. of Environmental Science. For primary bibliographic entry see Field 5A. W80-03175

SIMULATING NUTRIENT MOVEMENT AND TRANSFORMATIONS WITH THE ARM MODEL.

MODEL, Hydrocomp, Inc., Mountain View, CA. H. H. Davis, Jr., and A. S. Dinigian, Jr. Transactions of the American Society of Agricul-tural Engineers, Vol 22, No 5, p 1081-1086, Sep-tember-October 1979. 9 Fig, 1 Tab, 12 Ref.

Descriptors: *Nutrients, *Water pollution, *Runoff, *Agricultural runoff, *Model studies, Mathematical models, Nitrogen, Nitrates, Nitrites, Phosphorus, Phosphorus compounds, Agricultural chemicals, Fertilizers, Pollutants, Path of pollutants, Solutes, Sediments, Rainfall, Storms, Simulation analysis tion analysis.

The plant nutrient section of the Agricultural Runoff Management (ARM) Model was developed for the EPA as a tool for predicting the amounts of plant nutrients (N and P) removed from agricultural lands by precipitation-induced runoff and erosion. First-order kinetics were used to model the transformations, plant uptake, and sorption of soil temperatures on the first-order rates was calculated with a modified Arrhenius counting. Initial testing with a modified Arrhenius equation. Initial testing was performed with data from two small (less than 1.5 ha) watersheds in Michigan and Georgia. Initial results showed that the model was able to repre-

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources Of Pollution

sent soil nutrient data reasonably well. Monthly simulation results of N and P in the runoff were satisfactory; however, storm event simulation of soluble nutrients indicated further study of solution-based transport is needed. (Sims-ISWS)

SIMULATION OF NITROGEN AND PHOS-PHORUS LEACHING FROM POULTRY MANURE.

Cornell Univ., Ithaca, NY. Dept. of Agricultural

Engineering.

R. E. Muck, and D. C. Ludington.

Transactions of the American Society of Agricultural Engineers, Vol 22, No 5, p 1087-1092, September-October 1979. 6 Fig. 3 Tab, 26 Ref.

Descriptors: *Model studies, *Leaching, *Water pollution sources, *Farm wastes, Laboratory tests, Testing procedures, Mathematical models, Simulation analysis, Porous media, Nutrients, Nitrogen, Phosphorus, Theoretical analysis, Instrumentation

A model based on simple diffusion was developed to describe the leaching of soluble nitrogen and to describe the leaching of soluble nitrogen and phosphorus from dry poultry manure aggregates. The leaching losses of ammonia and organic nitrogen measured in laboratory experiments were successfully predicted with the model. Soluble orthophosphate losses were predicted with less success. These predictions could possibly be improved by considering phosphorus solubility. The model was considering phosphorus solubility. The model was considering phosphorus solubility. The model was not as successful, however, in predicting soluble nutrient losses from aggregates undergoing breakdown from rainfall impact. Consequently, for the model to be useful on the field level, this model must be combined with models predicting changes in manure aggregate size and other field phenomena. (Humphreys-ISWS) W80-03181

TILLAGE SYSTEM EFFECTS ON SEDIMENT AND NUTRIENTS IN RUNOFF FROM SMALL WATERSHEDS,

Iowa State Univ., Ames. Dept. of Agricultural

Engineering. H. P. Johnson, J. L. Baker, W. D. Shrader, and J. M. Laflen.

Transactions of the American Society of Agricultural Engineers, Vol 22, No 5, p 1110-114, September-October 1979. 2 Fig. 3 Tab, 11 Ref.

Descriptors: *Runoff, *Sediments, *Nutrients, *Agricultural watersheds, Farm management, On-site investigations, Sampling, Pollutants, Water pollution, Phosphorus, Nitrogen, Erosion, Corn(Field), Water pollution sources, Path of pol-lutants, Hydrology, Tillage practices, Crop resi-

Two conservation tillage systems were studied and compared with the conventional (plow-disk-plant) tillage system. Runoff, soil loss, and nutrient losses during the 1973-75 growing seasons were measured for six small, paired watersheds planted to continuous corn (runoff and soil loss for the year 1972). 1972, when conservation tillage systems were being established, were also measured). Fifty-nine being established, were also measured). Fifty-nine percent of the soil surface under ridge-planting and 11% under till-planting were covered with crop residue, compared to less than 2% for conventional planting. Conservation tillage systems on the average reduced runoff about 40% and reduced soil loss from 60 to 90%. Total losses of nitrogen and phosphorus (total P in sediment measured only in 1973) were mostly associated with soil loss and consequently were decreased for conservation tillage systems. Solution phosphorus losses and concentrations and available P concentrations in sediment (measured in 1974 and 1975) increased with residue cover. Several factors could be responsible, including decreased fertilizer incorporation, selecincluding decreased fertilizer incorporation, selec-tive erosion processes, and the residue being a phosphorus source. Corn yield data were given. (Sims-ISWS)

NUTRIENT LOADS IN STREAMFLOW FROM

MI

SANDY SOILS IN FLORIDA,
Florida Univ., Gainesville. Dept. of Agricultural

Engineering. K. L. Campbell.

Transactions of the American Society of Agricultural Engineers, Vol 22, No 5, p 1115-1120, September-October 1979. 8 Fig, 8 Tab, 12 Ref.

Descriptors: "Streamflow, "Nutrients, "Agricultural watersheds, "Land use, "Florida, Fertilizers, Precipitation(Atmospheric), Rainfall, Runoff, Agricultural runoff, Soils, Pollutants, Nitrates, Ammonia, Phosphorus, Phosphorus compounds, Watersheds(Basins), Hydrology, Path of pollutants, Water pollution, Water pollution sources.

Two agricultural watersheds with different land uses were instrumented to determine water quanti uses were instrumented to determine water quanti-ty and quality measurements. Nitrogen and phos-phorus loads in streamflow were about proportion-al to the flow volume. Nutrient losses in stream-flow were very small when compared with the other components of nutrient balances in the two observed watersheds. Nitrogen and phosphorus losses in runoff were equivalent to about 5% of the commercial fertilizer applied and were less than the amounts received by the land area in precipitation. (Sims-ISWS)

OXYGEN DEFICIT--PHOSPHORUS LOADING

Washington Univ., Seattle. E. B. Welch, and M. A. Perkins. Journal of the Water Pollution Control Federation, Vol 51, No 12, p 2823-2828, December 1979. 3 Fig. 1 Tab. 13 Ref.

Descriptors: *Dissolved oxygen, *Phosphorus, *Lakes, *Eutrophication, Hypolimnion, Model studies, Mathematical models, Oxygen, Oxygen demand, Water quality, Water pollution, Pollutants, Path of pollutants, Chemicals, Limnology, Oxygen depletion, Phosphorus loading.

Oxygen deficit rate in 26 lakes was found to be positively correlated with phosphorus loading normalized for flushing rate with an r of 0.73. The limit for eutrophic waters of 550 mg O2/sq m per day proposed by Mortimer has considerable merit if the exercise equation found have in applied to if the regression equation found here is applied to Vollenweider's critical limit for annual, areal P loading = 200(Z sub rho) to the 0.5 power. The loading = 200(2 sub rno) to the 0.5 power. The predicted oxygen deficit from that loading would result in stressful oxygen levels for hypolimnion-seeking fish during late summer. (Sims-ISWS) W80-03185

IMPACT OF DEVELOPMENT ON WATER-SHED HYDROLOGIC AND NUTRIENT BUD-

Wisconsin Univ.-Madison. Center for Biotic Sys-V. J. Watson, O. L. Loucks, J. Mitchell, and N. L.

Journal of the Water Pollution Control Federation Vol 51, No 12, p 2876-2885, December 1979. 2 Fig. 4 Tab, 28 Ref. NSF DEB76-11776, DEB76-12294.

Descriptors: *Nutrients, *Lakes, *Nitrogen, *Phosphorus, Runoff, Chemicals, Pollutants, Eutrophication, Urbanization, Land development, Drainage, Watersheds(Basins), Hydrology, Limnology, *Lake George(NY), *Lake Wingra(WI).

This study assessed the impact of development on This study assessed the impact to development on the hydrologic and nutrient budgets of contrasting watershed systems. Nutrient yields from the water-sheds of oligotrophic Lake George (New York) and eutrophic Lake Wingra (Wisconsin) were estiand cutropnic Lake Wingra (Wisconsin) were esti-mated from measured nutrient concentrations and hydrologic flows and from hydrologic budget computations and were compared to reconstructed presettlement yields. Development-induced changes within the watersheds have altered phoschanges within the watersheds have alreed prios-phorus budgets more than nitrogen budgets, but the greatest impact on the Lake George budget comes from nitrogen-enriched precipitation. The Lake Wingra watershed appears to have been most affected by the alteration of its hydrology and morphology (Sims-ISWS) W80-03186 RELATIONSHIPS BETWEEN STREAM DISCHARGE AND YIELD OF DISSOLVED SUBSTANCES FROM A COLORADO MOUNTAIN

STANCES FROM A COLUMBDO MOUNTAIN WATERSHED, Colorado Univ., Boulder. Dept. of Environmental, Population, and Organismic Biology. W. M. Lewis, Jr., and M. C. Grant. Soil Science, Vol 128, No 6, p 353-363, December 1979. 4 Fig. 1 Tab, 33 Ref.

Descriptors: "Discharge(Water), "Chemicals, *Watersheds(Divides), "Mountains, "Colorado, Sampling, Chemical analysis, Data processing, Streamflow, Ions, Cations, Nitrogen, Nitrogen compounds, Phosphorus, Carbon, Sodium, Nutri-ents, Magnesium, Calcium, Runoff, Path of pollut-ants, Water pollution sources.

The dependence of concentration and yield of dissolved substances on water discharge was studied over a 150-week period in the watershed of Como Creek, Colorado, near the Continental Divide. Substances were divided into three groups on the basis of relationship between concentration and discharge. (1) substances whose concentrations. on the basis of relationship between concentration and discharge: (1) substances whose concentrations decrease with increasing discharge (HC03(-), N03(-), Ca(2+), Mg(2+), Na(+)); (2) substances whose concentrations show no trend with discharge (NH4(+), dissolved organic phosphorus and nitrogen, K(+), S04(2-)); (3) substances whose concentrations increase with increasing discharge (dissolved organic carbon, H(+), P04(3-)). The concentration-discharge relationships were compared between years and generally showed evidence of a common slope between years, even though discharge and weather varied considerably between years. Mean concentrations between years were years. Mean concentrations between years were compared statistically at a common discharge and showed no significant differences between years, suggesting common control mechanisms between snowed no significant differences between years, suggesting common control mechanisms between years for a given substance. Substances were also compared with respect to yield (product of concentration and discharge). Three categories of yield response to increasing discharge were identified. All showed increasing discharge were identified. All showed increasing yield with increasing discharge but with: (1) yield increasing slower than discharge (HCO3/-), NO3(-), Ca(2+), Mg(2+), Na(+)); (2) yield increasing at the same rate as discharge (NH4(+), DON); (3) yield increasing faster than discharge (DOP, K(+), S04(2-), DOC, H(+), P04(3-)). Simple groundwater-precipitation mixing models are not adequate to explain these differences in concentration and yield responses to discharge. A satisfying mechanism to explain the differences between responses of dissolved substances to discharge must take into account not only mixing but also the chemical reaction of incoming precipitation with soil and soil water and the intensity of biological demands for the substances. (Sims-ISWS) stances. (Sims-ISWS) W80-03191

A MODEL FOR EVALUATING RUNOFF-QUALITY IN METROPOLITAN MASTER PLANNING,

Water Resources Engineers Inc., Walnut Creek,

L. A. Roesner, H. M. Nichandros, R. P. Shubinski, A. D. Feldman, and J. W. Abbott. Hydrologic Engineering Center, Technical Paper No 58, April 1974. 80 p. 25 Fig. 19 Tab, 13 Ref.

Descriptors: *Urban runoff, *Water quality, *Model studies, *Cities, *Planning, Watersheds(Basins), Runoff, Storm runoff, Hydrology, Runoff coefficient, Depression storage, Water pollution sources, Storm drains, Roads, Discharge(Water), Biochemical oxygen demand, Combined sewers, Water pollution, Pollutants, Nitrogen, Chemical oxygen demand, Data collections, Rainfall, Overflow, Infiltration rates, Catch hasins

The purpose of this document was to present an analytical method that can be used in the preliminary planning stage in the development of a pollution control program. The method has been coded tion control program. In method has been coded into a computer program called STORM (Storage, Treatment, Overflow, and Runoff Model). This program represents a method of analysis to estimate the quantity and quality of runoff from small, primarily urban, watersheds. Nonurban areas may

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution-Group 5B

also be considered. Land surface erosion for urban and nonurban areas is computed in addition to the basic water quality parameters of suspended and settleable solids, biochemical oxygen demand, total mitrogen, and orthophosphate. The purpose of the analysis is to aid in the selection of storage and treatment facilities to control the quantity and quality of urban stormwater runoff and land surface erosion. The model considers the interaction of eight variables: (1) precipitation, (2) air temperature for snowpack accumulation and snowmelt, 30 runoff, (4) pollutant accumulation on the land surface, (5) land surface erosion, (6) treatment rates, (7) storage, and (8) overflows from the storage/treatment system. Items (3), (4), and (5) are related to land use. Land uses accounted for in the model also be considered. Land surface erosion for urban treatment system. Items (3), (4), and (5) are related to land use. Land uses accounted for in the model include: single family residential, multiple family residential, commercial, industrial, parks, and non-urban or undeveloped areas. The program is designed for use with many years of continuous simulation model but may be used for selected single events. This program is available for the IBM 360/50, UNIVAC 1108, and CDC 6600 or 7600 computer systems. It requires about 35,000 words of core storage and a FORTRAN IV compiler that accepts multiple ENTRY statements. (Humphreys-ISWS)

EFFECTS OF ABRUPT CHANGE IN WATER QUALITY ON RAINBOW TROUT (SALMO GAIRDNERI RICH.), Genoa Univ. (Italy). Inst. of Zoology. For primary bibliographic entry see Field 5A. W80-03210

EUTROPHICATION, MINUTE ALGAE AND INEFFICIENT GRAZERS, Oslo Univ. (Norway). Inst. of Zoology.

J. P. Nilsse J. P. Nilssen. Memorie dell'Istituto Italiano di Idrobiologia, Vol 36, p 121-138, 1978. 3 Fig, 101 Ref.

Descriptors: *Trophic level, *Nutrients, *Aquatic algae, *Lakes, Productivity, Herbivores, Predation, Eutrophication, Oligotrophy, Phosphorus, Copepods, Invertebrates, Nannoplankton, Cyanophyta, Phytoplankton.

The processes leading from an oligotrophic to a eutrophic state and the reverse are not simple functions of P-loadings. A number of stabilizing and de-stabilizing factors are put into action during these processes. One of the most significant of these includes changes in the grazer community due to increased size-selective predation from both fish and invertebrate predators, mainly cyclopoid copepods. This results in decreased control of nan-noplankton outbursts, with subsequent nutrient depletion and low water transparency. These conditions are favourable for BG algal growth. A rapid way to restore the lake would probably be to decrease predation pressure on large filter feeders. Simultaneously the external loadings must be decreased. (Deal-EIS)

A STUDY OF THE DISTRIBUTION OF MER-CURY IN THE VARIOUS COMPARTMENTS OF THE NORTH SEA AND SCHELDT ESTU-

ARY ECOSYSTEMS,
Beheerseenheid Model Noordzee en Schelde Brus-Sel, (Belgium).
For primary bibliographic entry see Field 5A.
W80-03213

ECOLOGICAL EFFECTS OF DISPERSANTS IN THE UNITED KINGDOM, Society of Petroleum Industry Biologists, Los Angeles, CA.
E. B. Cowell.
In: Chemical Dispersants for the Control of Oil Spills, ASTM STP 659, L. T. McCarthy, Jr., G. P. Lindblom and H. F. Walter, Eds., American Society for Testing and Materials, p 277-292, 1978. 4 Fig, 4 Tab, 36 Ref.

Descriptors: *Toxicity, *Bioassay, *Oil spills, Oil, Organic compounds, Environmental effects,

Aquatic life, Water pollution control, Shrimp, Crab, Clams, Mortality, Seasonal, Coasts, Surfac-tants, *Dispersants, *Oil dispersants.

tants, *Dispersants, *Oil dispersants.

The problems associated with the toxicity of dispersants at the time of the Torrey Canyon disaster are described together with subsequent developments to reduce toxicity. The problems of laboratory bioassay and its limitations in ecological prediction are reviewed in relation to dispersant concentrations that are reached under field use. Problems of the use and ecological effects of dispersants in shore cleaning are described in association with practical aspects of safe application and limitations. The author concludes that modern dispersant formulations can be used with minimum ecological risk provided the application is done with care by trained operators. It is stressed that even the most recently developed materials should not be used on areas of vascular plants such as salt marshes and mangroves. The lack of adequate research precludes recommending dispersants to treat oil spillage in freshwater rivers and lakes unless the bodies of water are extremely large. (Deal-EIS)

THE ROLE OF ZOOPLANKTON FECAL PEL-LETS IN THE SEDIMENTATION OF POLYCY-CLIC AROMATIC HYDROCARBONS IN DABOB BAY, WASHINGTON, Washington Univ., Seattle. Dept. of Oceanog-raphy.

raphy. For primary bibliographic entry see Field 5A. W80-03220

EFFECT OF ENVIRONMENTAL SALINITY OF HAEMOLYMPH AND TISSUES OF MUSSELS, Akademiya Nauk SSSR, Leningrad. Lab. of Comparative Biochemistry of Inorganic Ions. For primary bibliographic entry see Field 5A. W80-03222

EFFECT OF DISSOLVED PETROLEUM PRODUCTS ON CARBOHYDRATE METABO-LISM OF THE LIVER OF TWO BLACK SEA

SPECIES OF FISHES, Akademiya Nauk SSSR, Leningrad. Inst. Evolyutmoi Fiziologii i Bokhimi G. I. Kovaleva.

The Soviet Journal of Marine Biology, Vol 5, p 48-52, 1979. 4 Tab, 15 Ref.

Descriptors: *Oil, *Toxicity, *Fish physiology, Animal metabolism, Biochemistry, Carbohydrates, Mode of action, Cytological studies, Animal pa-thology, Chemical reactions, *Tissue analysis, *Liver, *Glucose, *Solea, *Spicara.

Glucose production by isolated sections of the liver of picarel (Spicara smaris L.) and Black Sea sole (Solea lascaris nasuta Pallas) during poisoning by dissolved petroleum is studied. It is shown that in vitro petroleum in a concentration of 1.8 and 3.0 microg/ml increases the production of glucose by the liver sections. Poisoning of fishes in vivo reveals hyperglycemia, a reduction in the content of plucose in the liver and also a decrease in the veats hypergiveema, a reduction in the content of glycogen in the liver, and also a decrease in the production of glucose by the isolated liver sec-tions. The possible causes of these phenomena are discussed. The author assumes there is active detoxification of carbohydrates of petroleum in the liver which is accompanied by losses of energy resources and consumption of glucose. (Deal-EIS) W80-03223

MONITORING OF CHLORINATED HYDRO-CARBONS IN BIOTA OF THE NORTH AND MIDDLE ADRIATIC COASTAL WATERS,

Institut Rudjer Boskovic, Rovinj (Yugoslavia). Center for Marine Research. B. Nazansky, N. Picer, M. Picer, and M. Ahel. B. Nazansky, N. Picer, M. Picer, and M. Ahel. In: IVes journees d'etudes sur les pollutions marines en Mediterranee, Commission Internationale Pour L'Exploration Scientifique De La Mer Mediterranee, Monaco, 24-27 November 1978, Antalya, Turkey, p 129-132, 1979. 1 Fig, 1 Tab, 4 Ref.

Descriptors: *Pesticide residues, *Aquatic life, *Monitoring, Chlorinated hydrocarbon pesticides,

DDT, Polychlorinated biphenyls, Mussels, Marine fish, Plankton, Chemical analysis, Water pollution sources, Industrial wastes, *Adriatic Sea, *Tissue analysis, River Po.

Since 1974 about 200 biota samples (mussel, Myti-lus galloprovincialis, various benthic fishes and net plankton) covering areas of Istrian coastal waters, Rijeka Bay, Losinj, and coastal waters near the town of Zadar, have been analysed. Results (total DDT and PCBs concentrations) are given as geometrical means and discussed according to the investigated areas and biota species. The possible influences of local pollution sources and the inflow of the river Po and its effluents are discussed. W80-03226

LEVELS OF METAL POLLUTANTS IN SEDI-MENTS AND BIOTA OF THE GULF OF TRI-ESTE: A LONG TERM SURVEY, Trieste Univ. (Italy). Inst. of Hygiene. For primary bibliographic entry see Field 5A. W80-03228

TRACE ELEMENTS IN PELAGIC ORGAN-ISMS AND A PELAGIC FOODCHAIN OF THE AEGEAN SEA, Democritus Nuclear Research Center, Athens (Greece). Radioanalytical Lab.

For primary bibliographic entry see Field 5A. W80-03229

POLLUTION MONITORING OF ELEVEN TRACE ELEMENTS IN THREE MARINE ORGANISMS FROM SARONIKOS GULF, GREECE.

Democritus Nuclear Research Center, Athens (Greece). Radioanalytical Lab. For primary bibliographic entry see Field 5A. W80-03230

TRACE METALS AND ORGANOCHLORINE RESIDUE CONTENT OF MULLIDAE FAMILY FISHES AND SEDIMENTS IN THE VICINITY OF ERDEMLI (ICEL), TURKEY, Middle East Technical Univ., Ankara (Turkey). Dept. of Marine Science.

For primary bibliographic entry see Field 5A. W80-03231

THE IMPACTS OF WASTES FROM A PHOSPHATE PLANT ON THE MARINE ENVIRONMENT (GULF OF GABES, TUNIS) (IN FRENCH),

Institut National Scientifique et Technique d'Oceanographie et de Peche, Tunis (Tunisia). Lab. de Biologie Marine.

rmoul, P. Vitiello, and M. H. A. Salem B. Darmoul, F. Vileno, and N. H. A. Salem. In: IVes journees d'études sur les pollutions ma-rines en Mediterranee, Commission Internationale Pour L'Exploration Scientifique De La Mer Medi-terranee, Monaco, 24-27 November 1978, Antalya, Turkey, p 343-345, 1979. 1 Fig, 3 Ref.

Descriptors: *Water pollution effects, *Benthos, Industrial wastes, *Phosphates, Sediments, Silting, *Eutrophication, Acidic water, Mediterranean, Tunis, Gulf of Gabes, Environmental effects, Mol-

The discharge in the sea of phosphate industrial waste has caused several perturbations: increase of sea water turbidity and of siltation, overmuch enrichment of environment in phosphate and fluor, acidification of beach area's water, degradation of Posidonia meadow and the complete destruction of benthic community in an important area adjacent to the waste discharge. (Katz-EIS) W80-03232

DISTRIBUTION AND IMPACT OF ANIONIC DETERGENTS ON A PELAGIC ECOSYSTEM. (IN FRENCH).

Centre Universitaire de Luminy, Marseille (France). Lab. d'Hydrobiologie Marine. In: IVes journees d'etudes sur les pollutions ma-

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Group 5B-Sources Of Pollution

rines en Mediterranee, Commission Internationale Pour L'Exploration Scientifique De La Mer Medi-terranee, Monaco, 24-27 November 1978, Antalya, Turkey, p 381-384, 1979. 6 Ref, (English abstract).

Descriptors: *Detergents, *Path of pollutants, *Mathematical models, Methodology, Chemical wastes, Chemical properties, Persistence, Domestic wastes, Water pollution sources, Monitoring, Toxicity, Lethal limit, Benthic fauna, Mediterranean

An attempt to assess the input per day of anionic detergents into the Mediterranean Sea was made. Furthermore, dispersion, persistency and dilution were calculated in relation to variable fluxes and were calculated in relation to variable fluxes and meteorological conditions. By means of a mathematical model, we have shown that detergents are better tracers of pollutant dispersion than dilution sheet. Concentrations found in the whole prospector gions were very often sufficiently high to perturb the physiology and the development of many zooplanktonic species. (Deal-EIS)

MERCURY CONCENTRATIONS IN PELAGIC FISHES (ANCHOVY, MACKEREL AND SAR-DINE) FROM THE ITALIAN COAST AND

STRAIT OF GIBRALTAR, Siena Univ. (Italy). Lab. di Idrobiologio. For primary bibliographic entry see Field 5A. W80-03236

MONITORING OF CHLORINATED HYDRO-CARBONS IN WATER AND SEDIMENTS OF THE NORTH ADRIATIC COASTAL WATERS, Institut Rudjer Boskovic, Rovinj (Yugoslavia) Center for Marine Research. For primary bibliographic entry see Field 5A. W80-03237

MONITORING OF CHLORINATED HYDRO-CARBONS IN BIOTA AND SEDIMENTS OF SOUTH ADRIATIC COASTAL WATERS, Biological Inst., Dubrovnik (Yugoslavia). For primary bibliographic entry see Field 5A. W80-03238

ACCUMULATION AND DISTRIBUTION OF HEAVY METALS IN SOME MARINE ORGANISMS IN THE BAY OF IZMIR AND IN AEGEAN COASTS, Ege Univ., Izmir (Turkey). Dept. d'Oceanographique Biologique. For primary bibliographic entry see Field 5A. W80-03239

HEAVY METALS AND CHLORINATED HY-DROCARBONS IN PELAGIC ORGANISMS
FROM THE OPEN MEDITERRANEAN SEA,
International Lab. of Marine Radioactivity, Monte
Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5A.
W80-03241

CONCENTRATION OF THE HERBICIDE 2,4-D BY SOME HIGHER WATER PLANTS, Kharkov Vodokanalniiproekt Inst. (USSR)

A. A. Titova. Hydrobiological Journal, Vol 14, No 4, p 96-97, 1978. 1 Fig. 7 Ref.

Descriptors: *2,4-D, *Aquatic plants, *Pesticide kinetics, Herbicides, Chlorinated hydrocarbon pesticides, Path of pollutants, Radiochemical analysis, Tracers, Chemical properties, Absorption, *Bioaccumulation, *Tissue analysis, *Salvinia, *Duckweed, *Elodea, *Water milfoil, *Hornwort.

JMI

It has been established in the course of radioiso this been established in the course of radioiso-tope research that there are differences in the resistance of higher water plants (Salvinia, duck-weed, Elodea, water milifoil, hornwort) to the he-bicide 2,4-D and in their capacity to concentrate it. The first three species are active concentrators of this preparation. The established accumulation capacity of the higher water plants confirms their potential role in water protection. (Deal-EIS)

W80-03243

HYDROCARBON CHARACTERISTICS OF THE ORGANS AND TISSUES OF SOME MARINE FISHES FROM THE MEDITERRA-

NEAN, Institute of the Biology of the Southern Seas, Sevastopol (USSR). T. L. Shchekaturina, and O. G. Mironov. Journal of Ichthyology, Vol 18, No 6, p 1026-1029, 1978. 6 Fig. 1 Tab, 9 Ref.

Descriptors: *Organic compounds, *Absorption, *Fish physiology, Chemical analysis, Animal metabolism, Path of pollutants, Marine fish, Lipids, Chemical properties, Chromatography, *Tissue analysis, *Bioaccumulation, *Mediterranean Sea, *Paraffins.

Bottom and pelagic fish, the hake (Merluccius merluccius), the mackerel (Scomber scombrus), the scad (Trachurus trachurus), and the spiny dogfish (Squalis acanthias) caught in the western Mediterranean were analysed for hydrocarbon content. Saturated hydrocarbons in the organs and tissues of the fish ranged from 19.3 to 318.8 microg/100 g wet weight. C15, C17 and C19 accounted for the highest percentage. Of the saturated hydrocarbons with a branched chain pristane was found in considerable quantities. (Deal-EIS)

ON THE CORRESPONDENCE OF DATA ON THE INCUBATION OF FISH EGGS IN SOLUTIONS OF STRONTIUM-90 — YTTRIUM-90 OF VARYING ACTIVITY UNDER LABORAROTY CONDITIONS AND IN NATURAL WATERS,
Vserossiiskii Nauchno-Issledovatelskii Inst.
Prudpvpgp Rybnogo Khozyaistva, Moscow Prudpvpgp (USSR). For primary bibliographic entry see Field 5A. W80-03250

PHYSIOLOGICAL-BIOCHEMICAL DATA ON EXPERIMENTAL INTOXICATION OF FISH WITH 'YALAN', Kaspiiskii Nauchno-Issledovatelskii Inst. Rybnogo

Khozyaistva, Astrakhan (USSR). For primary bibliographic entry see Field 5A. W80-03251

POLYCYCLIC AROMATIC HYDROCARBON CARCINOGENS IN COMMERCIAL SEA-

FOODS, British Columbia Cancer Research Center, Van-For primary bibliographic entry see Field 5A. W80-03252

ASSIMILATION EFFICIENCY OF DIETARY METHYLMERCURY BY NORTHERN PIKE

Montana State Univ., Bozeman. Dept. of Biology. For primary bibliographic entry see Field 5A. W80-03253

ACCUMULATION AND EXCRETION OF 95ZR AND 95NB BY COMMON GOBY (ACANTHO-GOBIUS FLAVIMANUS),

National Inst. of Radiological Sciences, Nakaminato (Japan). Div. of Marine Radioecology. For primary bibliographic entry see Field 5A. W80-03256

INDICATORS OF PHOSPHORUS AND NITROGEN DEFICIENCY IN FIVE ALGAE IN

Department of Fisheries and Marine Services, Winnipeg (Manitoba). Freshwater Inst. For primary bibliographic entry see Field 5A. W80-03258

PCBS AND DDE IN COMMERCIAL FISH FEEDS National Marine Fisheries Service, Ann Arbor,

MI. Great Lakes Fishery Lab. For primary bibliographic entry see Field 5A. W80-03259

BIOAVAILABILITY OF A HYDROCARBON FROM WATER AND SEDIMENT TO THE MARINE WORM ARENICOLA MARINA, Trinity Coll., Dublin (Ireland). Dept. of Microbi-

ology. M. C. Lyes. Marine Biology, Vol 55, p 121-127, 1979. 3 Fig, 1

Descriptors: *Oil, *Worms, *Animal metabolism, Oil spills, Oil pollution, Absorption, Metabolism, Path of pollutants, Chemical properties, Animal physiology, Bottom sediments, Benthic fauna, Radiochemical analysis, Tracers, Carbon radioisotopes, Biochemistry, *Waphthalene, *Bioaccumulation, *Depuration, *Tissue analysis.

The uptake, accumulation and depuration of a labelled hydrocarbon (14C-1-naphthalene) by the marine annelid Arenicola marina were studied. Naphthalene was chosen because it is an important component of oil and is known to be toxic to marine organisms. The bioavailability of the hydrocarbon to the worm from contaminated sediuncerron to the worm from contaminated sediment is examined and the results discussed with reference to the rehabilitation of oiled environments, as A. marina is thought to be capable, in high numbers, of greatly reworking sediments. (Deal-EIS) W80-03260

UPTAKE AND CELLULAR DISTRIBUTION OF CADMIUM IN MYTILUS EDULIS, Kiel Univ. (Germany, F.R.). Zoologisches Inst. H. H. Janssen, and N. Scholz. Marine Biology, Vol 55, p 133-141, 1979. 4 Fig, 3 Tab, 31 Ref.

Descriptors: *Cadmium, *Absorption, *Mussels, Path of pollutants, Heavy metals, Metabolism, Animal metabolism, Animal physiology, Feeding rates, *Mercury, Cytological studies, Mode of action, Electron microscopy, Biological membranes, *Tissue analysis, *Bioaccumulation, *Midgut gland.

Cadmium uptake has been studied in starved and fed Mytilus edulis L. It is suggested that fairly elevated cadmium contents in fed mussels are not due to contaminated food, but to increased pumping rate when food is available. Highest concentration and main body burden are found in the midgut gland. Transport via haemolymph, and selective discrimination at the basement lamina of the mid-gut gland tubuli are regarded as mainly responsible for accumulation. Mercury seems to be processed in a similar was as cadmium. In the tubuli, both metals are immobilized in membrane-bound vesicles, which are finally defaecated. (Deal-EIS) (Deal-EIS) W80-03263

UPTAKE OF HYDROCARBONS BY THE MARINE DIATOM CYCLOTELLA CRYPTICA, University Coll. of North Wales, Menai Bridge. Marine Science Labs. For primary bibliographic entry see Field 5A. W80-03267

PRELIMINARY RESULTS ON UPTAKE AND ELIMINATION AT DIFFERENT TEMPERATURES OF P,P*-DDT AND TWO CHLOROBI-PHENYLS IN PERCH FROM BRACKISH

WATER, National Swedish Environment Protection Board, Stockholm. Research Lab. For primary bibliographic entry see Field 5A. W80-03268

ACCUMULATION OF CADMIUM BY GREEN MICROALGAE, Miyazaki Medical Coll. (Japan). Dept. of Chemis-

try. T. Sakaguchi, T. Tsuji, A. Nakajima, and T.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution—Group 5B

European Journal of Applied Microbiology and Biotechnology, Vol 8, p 207-215, 1979. 11 Fig, 1 Tab, 10 Ref

Descriptors: *Cadmium, *Absorption, *Chlorella, Chlorophyta, Scenedesmus, Chlamydomonas, Aquatic algae, Path of pollutants, Heavy metals, Metabolism, Membrane processes, Hydrogen ion concentration, *Bioaccumulation, *EDTA.

The accumulation of cadmium from aqueous systems by various green microalgae was investigated with focus on Chlorella regularis as it is known to with focus on Chlorella regularis as it is known to concentrate large amounts of heavy metals. The amount of cadmium absorbed by Chlorella cells was rapid during the first 30 min following addition of cadmium and then continued to be absorbed more slowly. The uptake of cadmium by Chlorella was not markedly affected by temperature or metabolic inhibitors. Most of the cadmium absorbed by EDTA. The amount of cadmium absorbed differed markedly with the plt will be of the solution and was inhibited with the plus of the solution and was inhibited. amount of cadmium assorbed differed markedly with the pH value of the solution and was inhibited by the presence of other divalent cations. Heat-killed Chlorella cells took up cadmium to a greater degree than living ones. From these results, it was considered that the uptake of cadmium into Chlorella cells was not directly mediated by metabolic categories. processes, rather it appeared completely dependent upon physico-chemical adsorption on the cell surface. The ability to accumulate cadmium was species specific and found to be (in decreasing order): Chlamydomonas reinbardtii>Chlorella cinalydoinional regularis > Scenedesmus obliqua > Chlamydomonas angulosa > Scenedesmus chlorelloides. (Deal-EIS) W80-03276

INFLUENCE OF CRUDE OIL AND DETER-GENTS ON THE CONCENTRATION OF SOME IONS IN HEMOLYMPH OF THE SHRIMP CRANGON CRANGON L. AND THE CRAB RHITHROPANOPEUS HARRISI GOULD, Akademia Medyczna, Gdansk (Poland). Dept. of

Biology. Z. Zbytniewski, G. Drewa, F. Pautsch, and T.

Z. Zoytniewski, G. Drewa, P. Pautsch, and T. Dabrowska.

Kieler Meeresforschungen, Vol 4, p 366-369, 1978.

1 Tab, 12 Ref.

Descriptors: *Oil, *Detergents, *Toxicity, *Shrimp, *Crabs, Oil spills, Surfactants, Ions, Animal physiology, Animal metabolism, Sodium, Calcium, Chlorides, Magnesium, Potassium, Mode of action, Membrane processes, Permeability, Enzymes, Biochemistry, Crustaceans, Oil pollution, *Crude oil, *Tissue analysis.

Solutions of detergent or crude oil of 10 ppm, 50 ppm, and 100 ppm after 48-96 hours of exposure induce significant changes in the ionic composition of the hemolymph of the shrimp Crangon crangon and the crab Rhithropanopeus harrisi. The concentrations of sodium, calcium, and chloride ions decrease, whereas the concentration of potassium increases in both species exposed to both pollutants. The magnesium ion concentration decreases in the hemolymph of the shrimp incubated in solutions of detergent and in the crab incubated in the water containing crude oil. It is suggested that changes in the ionic composition of the hemo-lymph of the studied shrimps and crabs under influence of both pollutants are possibly brought about by alteration of cell membrane permeability and action on some enzyme activities. (Deal-EIS) W80-03277

ACTIVITY OF LIVER FRUCTOSE 1,6 BIPHOS-PHATASE IN RAINBOW TROUT HELD IN DIFFERENT CONCENTRATIONS OF INDIS-SOCIATED AMMONIA (IN ITALIAN).

SOCIATED AMMONIA (IN 11 ALIAN), Genoa Univ. (Italy). Ist. di Zoologio. A. Arillo, L. Lamba Doria, and C. Margiocco. Memorie dell'Istituto Italiano di Idrobiologia, Vol 36, p 163-170, 1978. 1 Fig, 4 Tab, 20 Ref. (English

Descriptors: *Enzymes, *Toxicity, *Ammonia, Rainbow trout, Hydrogen ion concentration, Biochemistry, Proteins, Fish physiology, Animal me-

tabolism, Phosphorus compounds, Chemical analysis, Liver fructose 1,6-biphosphatase, *Tissue anal-

Liver fructose 1,6-biphosphatase was tested in trout (Salmo gairdneri) kept in different ambient concentrations of NH3. Results show a significant decrease of fru-P2-ase activity (pH 7.5) in treated specimens after 60 min. incubation of extracts. The ratio between the observed activities at pH 7.5 and 15 between the observed activities at pH 7.5 and 9.5 also decreases significantly in treated specimens. These results are indicative of increased proteolytic activity in NH3 treated animals. (Deal-EIS) w80-03279

ORGANOCHLORINES AND METALS IN HAR-BOUR SEALS (DUTCH WADDEN SEA), Netherlands Inst. voor Onderzoek der Zee. J. C. Duinker, M. Th. J. Hillebrand, and R. F. Marine Pollution Bulletin, Vol 10, p 360-364, 1979. 4 Tab, 24 Ref.

Descriptors: *Pesticide toxicity, *Heavy metals, *Aquatic animals, Polychlorinated biphenyls, *DDT, DDE, DDD, Dieldrin, *Zinc, *Iron, *Copper, *Manganese, *Lead, *Cadmium, *Chromium, Animal populations, Chemical analysis, Gaschromatography, Water pollution effects, Toxicity, *Seals, *Harbor seals, *Mirex, *Tissue analysis,

Maximum concentrations of PCB and members of the DDT family in liver, brains, kidney, spleen and heart anc Cu, Pb, Zn and Cd in brains of harbour seals found dead in the Dutch Wadden Sea are higher than those reported for specimens from the German Wadden Sea, where the population is stable in contrast to the strong reduction observed for the population in the former part. Results are static in contrast to the strong reduction observed for the population in the former part. Results are also compared with data from the east coast of England. It has not yet been established which are the main factors that may be responsible for the reduction in the population. (Deal-EIS) W80-03280

ISOLATION AND ELEMENTAL ANALYSIS OF METAL-RICH GRANULES FROM THE KIDNEY OF THE SCALLOP, PECTEN MAXI-

MUS (L.), Natural Environment Research Council, Aberdeen (Scotland). Inst. of Marine Biochemistry. For primary bibliographic entry see Field 5A. W80-03282

EFFECT OF LONG-TERM LEAD EXPOSURE ON THE SEAWATER AND SEDIMENT BACTERIA FROM HETEROGENEOUS CONTINU-

LERIA FROM HETEROGENEOUS CONTINU-OUS FLOW CULTURES, Institut fuer Meeresforschung, Bremerhaven (Ger-many, F.R.). Dept. of Bacteriology. For primary bibliographic entry see Field 5A. W80-03283

EFFECTS OF CRUDE OIL ON THE DEVELOP-MENT OF THE SHELL OF MYTILUS EDULIS (L) (MYTILIDAE, BIVALVIA), (IN FRENCH), Laboratoire de Zoologie, Aquaculture and Pollu-tions Marines, Brest (France). M. Le Pennec, and S. LeRoux. Revue Internationale D'Oceanographie Medicale, No 55, p 49-55, 1979. 2 Fig. 1 Tab, 4 Ref. (English Abstract)

Descriptors: *Mussels, *Oil, *Toxicity, Growth stages, Larval growth stage, Mode of action, Animal netabolims, Animal pathology, Bioassay, Oil pollution, *Teratogens, *Crude oil, *Tissue

Spawned eggs of Mytilus edulis have been exposed to two crude oils. The larval development was perturbed as a consequence the prodissoconch shell was abnormally formed. These abnormal shells were first observed under a light microscope than under a scanning electron microscope. The then under a scanning electron microscope. The majority of the polluted larvae show great modifications of the hinge and crystallisation of the shell.

CONCENTRATIONS OF ARSENIC, SELENI-UM AND TEN HEAVY METALS IN SCHOOL SHARK, GALEORHINUS AUSTRALIS (MA-CLEAY), AND GUMMY SHARK, MUSTELUS ANTARCTICUS GUNTHER, FROM SOUTH-EASTERN AUSTRALIAN WATERS, Victoria Dept. of Agriculture, Melbourne (Austra-lia) of the control of the co

For primary bibliographic entry see Field 5A. W80-03285

COMBINED EFFECTS OF CADMIUM, COPPER AND LEAD ON DEVELOPING HER-RING EGGS AND LARVAE, Biologische Anstalt Helgoland, Hamburg (Germany, F.R.). For primary bibliographic entry see Field 5A. W80-03286

LEAD TOXICOSIS AND SALT GLANDS IN DOMESTIC DUCKS, Pisa Univ. (Italy). Cattedra Patologia Generale Comparata. S. S. Buggiani, and S. Rindi.
Bulletin of Environmental Contamination & Toxicology, Vol 24, p 152-155, 1980. 1 Tab, 21 Ref.

Descriptors: *Lead, *Toxicity, *Ducks, *Electrolytes, Membrane processes, Osmosis, Path of pollutants, Animal metabolism, Salts, Heavy metals, *Osmoregulation, *Tissue analysis, *Blood chemis-

In a controlled experiment ducks were force-fed standard lead doses for 8 weeks. Data collected at the end of exposure consisted of; weight; hemoglo-bin value; number of red blood cells (RBCs); and lead quantity in the blood. All the ducks treated showed various degrees of anemia and signs of lead poisoning. After sacrifice, the lead concentra-tion in the nasal glands was also quantified. Lead concentrations in the nasal glands were much higher than in the blood. It was suggested that this indicated either the involvement of these glands in the elimination of lead or the impairment of transport processes at the cellular membrane levels. (Deal-EIS)

MERCURY, DDE, AND PCBS IN EGGS FROM A NORWEGIAN GANNET COLONY, Tromsoe Univ. (Norway).
For primary bibliographic entry see Field 5A.
W80-03288

IDENTIFICATION OF CHLORDANES AND RELATED COMPOUNDS IN GOBY-FISH FROM TOKYO BAY,
Tokyo Metropolitan Research Lab. of Public Health (Japan).
For primary bibliographic entry see Field 5A.
W80-03290

EFFECTS OF P,P'-DDT, P,P'-DDD, AND P,P'-DDE ON OXYGEN UPTAKE IN THE FRESHWATER PLANARIAN (PHAGOGATA GRACI-

Middle Tennessee State Univ., Murfreesboro For primary bibliographic entry see Field 5A. W80-03291

A POSSIBLE PHYSIOLOGICAL UPTAKE MECHANISM OF METHYLMERCURY BY THE MARINE BLOODWORM (GLYCERA DI-BRANCHIATA),
Illinois State Univ., Normal. Dept. of Biological

Sciences. For primary bibliographic entry see Field 5A. W80-03293

HEAVY METALS IN THE SEDIMENTS OF THE GULF OF BOTHNIA, Stockholm Univ. (Sweden). Dept. of Geology.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B-Sources Of Pollution

For primary bibliographic entry see Field 5A. W80-03295

TOXIC EFFECTS AND ACCUMULATION OF CADMIUM IN SOME BENTHIC ORGANISMS OF THE BALTIC, Kiel Univ. (Germany, F.R.). Inst. fuer Meeres

kunde.

For primary bibliographic entry see Field 5A. W80-03297

REVIEW OF EXPERIMENTS ON THE CHRONIC TOXICITY EXERTED BY SOME POLLUTANTS ON ANIMAL SPECIES FROM THE BAY OF GDANSK, Akademia Medyczna, Gdansk (Poland). Dept. of

For primary bibliographic entry see Field 5A. W80-03298

THE CYTOCHEMICAL DISTRIBUTIONS OF ZINC (ZN II) AND IRON (FE III) IN THE COMMON MUSSEL, MYTILUS EDULIS, AND THEIR RELATIONSHIP WITH LYSOSOMES,

Institute for Marine Environmental Research, Plymouth (England).
D. M. Lowe, and M. N. Moore.
Journal of the Marine Biological Association of the United Kingdom, Vol 59, p 851-858, 1979. 1 Tab, 36 Ref.

Descriptors: *Cytological studies, *Mussels, *Zinc, *Iron, Metals, Path of pollutants, Animal metabolism, Animal physiology, Animal populations, Absorption, Enzymes, Biochemistry, *Tissue analysis, *Bioaccumulation, *Bioavailability.

Zinc (Zn II) and iron (Fe III) were demonstrated histochemically in cytoplasmic inclusions shown to be lysosomes in a number of cell types in Mytilus edulis. The cellular distribution of the metals differed between the sexes; males were shown to have more zinc (Zn II) in the kidney than females, the latter appearing to use oocytes as an additional means of excretion. Differences in cellular distribu-tion of the metals was also demonstrated between tion of the metals was also demonstrated between the two populations studied probably reflecting availability of the metals in their respective envi-ronment. It is proposed that detoxication of the metal ions may be achieved by compartmentation in the lysosomal-vacuolar system. (Deal-EIS)

A LIGHT MICROSCOPIC STUDY OF THE ACTION OF SODIUM ORTHOVANADATE ON THE GILLS OF FRESH-WATER AND SEA-WATER EELS (ANGUILLA ANGUILLA L.), Natural Environment Research Council, Aberdeen (Scotland). Inst. of Marine Biochemistry. K. F. Kelly, B. J. Pirie, M. V. Bell, and J. R.

Journal of the Marine Biological Association of the United Kindgom, Vol 59, p 859-865, 1979. 2 Fig.

Descriptors: "Metals, "Toxicity, "Eels, Mode of action, Cytological studies, Sodium compounds, Microscopy, Animal physiology, Chemical properties, "Vanadium, "Vanadium compounds, "Tissue

Gills of fresh-water and sea-water eels were per-fused at a constant pressure with physiological Ringer containing 10(-6)M sodium orthovanadate and examined by light microscopy. The secondary and examined by ight microscopy. The secondary gill filaments were markedly vasoconstricted in both fresh-water and sea-water fish although the peripheral blood route around the secondary fila-ments was unaffected. The central venous space in the primary filaments was largely unaffected. Sigant constriction of both afferent and efferent arteries on the primary filament occurred. We con-clude that orthovanadate vaso-constricts eel gills mainly at the level of the secondary filaments. The study also emphasizes that chloride cells are located on both the primary and secondary filaments of fresh-water gills but solely on the primary filaments of sea-water gills. (Deal-EIS) W80-03300

JMI

5C. Effects Of Pollution

MEASUREMENT OF CARBON DIOXIDE COMPENSATION POINTS OF FRESHWATER ALGAE, York Univ., Downsview (Ontario). Dept. of Biol-

ogy.
B. C. Birmingham, and B. Colman.
Plant Physiology, Vol 64, No 5, p 892-895, November 1979. 3 Fig. 2 Tab, 28 Ref.

Descriptors: "Aquatic algae, "Anaytical techniques, "Carbon dioxide, "Hydrogen ion concentration, "Photosynthesis, Gas chromatography, Flame photometry, Chorella prenoidosa, Chlorella vulgaris, Cyanophyta, Chlamydomonas, Anabaena, Coccochloris, Phormidium, Diatoms, Cyclotella, Chlorophyta, Oxygen, Ionorganic compounds, Biochemistry, Cultures, Acidity, Albalis (Base) pounds, Bio Alkalis(Bases).

Measurements of total dissolved algal inorganic carbon by acid release as CO2 shows that CO2 compensation points at alkaline pH are uniformly low. It is suggested that these low CO2 compensation points are maintained by an active bicarbonate uptake by algae especially at alkaline pH. Measurement of CO2 compensation points of 16 freshwater algae were made using gas chromatography in conjunction with flame ionization. The compensation points at acid pH range 4.8-41.5 microl/1. Lowest values are for Chlorella pyrenoidosa and C. vulgaris, 5.8 and 4.8 microl/1 respectively, whereas those of most other algae range 15-20 microl/1. Lowering the medium O2 concentration at this pH does not have marked effects on compensation points. Compensation points for unicellular green algae. Chlorella and Chlamydomonas, blue-green algae Anabaena, Coccochioris and Phormidium, and diatom Cyclotella are not affected by changes in O2 concentration whereas compensation points of other species decrease, at most voice. ed by changes in O2 concentration whereas com-pensation points of other species decrease, at most by 50%. In contrast to compensation points at acid pH, CO2 compensation points at alkaline pH are uniformly low. At air-saturated O2 concentrations, compensation points of all species range 0.2-7.2 microl/1 and lowering O2 concentrations has no marked effects on any compensation points. Low, CO2-insensitive compensation points of algae are characteristic of C4 plants. (Harris-Wisconsin)

POLLUTION OF THE MARINE ENVIRON-MENT, National Marine Fisheries Service, Seattle, WA.

Northwest and Alaska Fisheries Center. D. C. Malins.

Environmental Science & Technology, Vol 14, No 1, p 32-37, January 1980. 2 Fig, 2 Tab, Illust.

Descriptors: "Water pollution effects, "Baseline studies, "Chemical wastes, "Oil pollution, Environmental effects, Resources development, Coasts, Ecosystems, "Outer Continental Shelf.

Many chemicals created to satisfy technological and economic demands will eventually find their way into the marine system. In addition an estimated four million metric tons of petroleum enter the marine environment each year. To protect our natural resources the effects of chemical pollutants on marine organisms and their habitats need to be studied. In the Environmental Conservation Division of the Northwest and Alaska Fisheries Center sion of the Northwest and Alaska Fisheries Center teams made up of specialists in analytical chemis-try, bio-chemistry, vertebrate and invertebrate pa-thology, electron microscopy, immunology, and behavioral biology are attempting to solve prob-lems involved in identifying chemical pollution in marine environments and in relating the findings to possible alterations in the health of marine organ-sms. Preliminary findings indicate that interactive possible attenuous in the neath of marine organisms. Preliminary findings indicate that interactive effects between two pollutants in marine organisms account for substantial alterations in certain biochemical systems and in cellular morphology. Interactive effects appear to bring about major alterations in biological systems of marine fishes. Reams of data acquired on the effects of exposing organ-isms to a single contaminants will be examined and research expanded to determine which interactions

occur and the degree of their impact. (Sinha -OEIS) W80-03011

THE TSESIS OIL SPILL: ITS IMPACT ON THE COASTAL ECOSYSTEM OF THE BALTIC SEA. Institute of Water and Air Pollution Research, Studsvik (Sweden).

O. Linden, R. Elmgren, and P. Boehm. Ambio, Vol 8, No 6, p 244-253, 1979. 13 Fig, 26

Descriptors: *Oil spills, *Water pollution effects, *Ecosystems, Coasts, Environmental effects, *Outer Continental Shelf, *Baltic Sea, Tsesis oil spill, Soviet tankers

The Tsesis study describes an attempt to investi-gate the full spectrum of effects of an oil spill on the ecosystem of a rather sheltered coastal archi-pelago in the atidal brackish Baltic Sea. The study demonstrated a number of effects of oil on various pelago in the atidal brackish Baltic Sea. The study demonstrated a number of effects of oil on various types of organisms. In general, however, the impact seems to have been of relatively short-term nature in the pelagic system, a conclusion supported also by the results of the investigations following the Torrey Canyon and Argo Merchant accidents. Increases in primary production among phytoplankton in impacted areas have been observed earlier. The stimulation of primary production in the area affected by the Tsesis oil spill is probably related primarily to the higher phytoplankton biomass in the area. The observed decrease of zooplankton in the vicinity of the ship was undoubtedly due to the acute toxic effects of the oil. The ly due to the acute toxic effects of the oil. The results of the investigations of the effects of the results of the investigations of the effects of the Tsesis oil on littoral communities indicate severe acute effects on all major faunal groups. These results together with results from a study of a very similar spill in the Stockholm archipelago suggest that complete recovery of a littoral community under these circumstances will take two to three years. (Sinha - OEIS)
W80-03012

MONITORING THE MARINE ENVIRON-MENT, PROCEEDINGS OF A SYMPOSIUM HELD AT THE ROYAL GEOGRAPHICAL SO-CIETY, LONDON, ON 28 AND 29 SEPTEMBER

sia of the Institute of Biology No 24, 1979. 217 p, Institute of Biology, London.

Descriptors: *Monitoring, *Water pollution effects, *Environmental effects, Resources development, Baseline studies, Oil pollution, Coasts, Surveys, Ecosystems, *Outer Continental Shelf, North Atlantic Ocean, North Sea, United Kingdom.

The theme of the symposium was the systematic observation of life in the sea and the effects of human activity on it. The Symposium brought together people interested in a wide range of topics in marine science. After the introduction on Marine Monitoring, the following papers were pre-sented: Intertidal Surveillance; Monitoring the sented: Intertidal Surveillance; Monitoring the Effect of Oil pollution on Rocky Seashores; Systematic Surveys and Monitoring in Nearshore Sublittoral Areas Using Diving; Monitoring with Deep Submersibles; Continuous Plankton Records - Monitoring the Plankton of the North Atlantic and the North Sea; The Monitoring of Substances in Marine Waters for Genetic Damage; Monitoring Whale and Seal Populations; Biological Monitoring Around an Oil Refinery; Monitoring Radioactivity in the Marine Environment; Monitoring the Effects of Domestic and Industrial Wastes; and Marine Wildlife Conservation in the Coastal Zone. (See W80-03014 thru W80-03024) (Sinha - OEIS) W80-03013 W80-03013

INTERTIDAL SURVEILLANCE,

INTERTIDAL SURVEILLANCE, University Coll. of North Wales, Menai Bridge. Marine Science Labs. W. E. Jones, A. Fletcher, S. J. Bennell, B. J. McConnell, and A. V. L. Richards. In: 'Monitoring the Marine Environment,' Symposia of the Institute of Biology No 24, p 1-23, 1979. 12 Fig, 2 Tab, 26 Ref.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Effects Of Pollution—Group 5C

Descriptors: *Monitoring, *Intertidal areas, *Water pollution effects, Baseline studies, Environmental effects, Resources development, *Outer Continental Shelf, Wales(UK).

The importance of baseline studies of intertidal areas to a proper assessment of the environmental areas to a proper assessment of the environmental effects of pollution is described. Information is given on the coastal surveillance program established around the coast of Anglesey and in either direction along the mainland coast east and west of the island. Some trends and deductions from the collected and partially assessment. collected and partially processed data are men-tioned. Emphasis is placed on changes resulting from natural events so that better judgments may be made following a pollution event. (See also W80-03013) (Sinha-OEIS)

MONITORING THE EFFECT OF OIL POLLU-

TION ON ROCKY SEASHORES, University Coll. of Swansea, (Wales). Dept. of

Zoology. A. Nelson-Smith. In: 'Monitoring the Marine Environment,' Sympo-sia of the Institute of Biology No 24, p 25-53, 1979. 7 Fig, 50 Ref.

Descriptors: *Monitoring, *Baseline studies, *Shores, *Water pollution effects, *Environmental effects, Oil pollution, Resources development, *Quter Continental Shelf, Rocky seashores, British

Any pronouncement about the effects of pollution upon the sedentary life of a stretch of seashore implies a knowledge both of the previous, untaint-ed state of that shore and of the magnitude of changes which would have taken place during the period of pollution, but from purely natural causes. Many forms of marine pollution have exerted their influence at a low intensity for such a period of influence at a low intensity for such a period of time that the shore biota may not been observed in their previous unaffected state or, perhaps at best, such observations may have been recorded only in a manner which does not permit careful comparison with their present condition. Even where clearly defined changes have been reliable demonstrated, it may be difficult to assign them to a particular influence (such as a polluting discharge) when others (for example, gradual climatic changes, unusual extremes of temperature, epidemics of disease, or invasions by predators, parasites, and exotic competitors) could have had a powerful an effect. The author considers all of the uses which can be made of work which was origiuses which can be made of work which was origiuses wnich can be made of work which was origi-nally carried out for purposes other than monitor-ing of pollution. He then discusses the applicability of various methods specifically for this purpose. (See also W80-03013) (Sinha - OEIS) W80-03015

SYSTEMATIC SURVEYS AND MONITORING IN NEARSHORE SUBLITTORAL AREAS USING DIVING,

Field Studies Council, Penbroke (England). Pollution Research Unit. K. Hiscock.

In: 'Monitoring the Marine Environment,' Symposia of the Institute of Biology No 24, p 55-74, 1979. 4 Fig, 25 Ref.

Descriptors: *Monitoring, *Surveys, *Water pollu-tion effects, *Environmental effects, Baseline stud-ies, Resources development, Scuba diving, *Outer Continental Shelf, Nearshore sublittoral areas.

The use of diving in marine biology in British waters has accelerated in recent years and a description of available techniques and equipment has been prepared for publication by the present author. This paper is concerned with the strategy of carrying out biological studies using diving. The type of data collected will depend on the information needed to satisfy the aims of the survey, the time available for collection and processing of tion needed to satisfy the aims of the survey, interime available for collection and processing of data, the methods of analysis to be used, and the level of accuracy which is possible. A knowledge of the environmental variables likely to affect the distribution and abundance of species will be required at the planning stage of a survey, particular-

ly if it is intended to study the effect of one physical or chemical factor and reduce the variation in others by careful selection of sites. The following factors are likely to be important: expo-sure to wave action and tidal streams; light; depth; suspended sediment concentration; the annual temperature range; salinity differences; geographical location; substrate type; and predator or dominant cover. (See also W80-03013) (Sinha - OEIS) W80-03016

MONITORING WITH DEEP SUBMERSIBLES,

Woods Hole Oceanographic Institution, MA. G. T. Rowe. In: 'Monitoring the Marine Environment,' Symposia of the Institute of Biology No 24, p 75-85, 1979.

Descriptors: *Monitoring, *Environmental effects, *Water pollution effects, Baseline studies, Ocean environments, Resources development, Research facilities, *Outer Continental Shelf, Submersibles, Deep Submergence Research Vessels(DSRV), DSRV Alux).

The open ocean, because it appears so vast and far Inc open ocean, occause it appears so vast and rar removed, has often been used as a recipient of urban and industrial wastes. Life in the shallow productive waters is vitally dependent on processes in the deep ocean. To know the consequences of using the deep-sea for waste disposal, monitoring is called for, but the great depths present formidable barriers to simple monitoring programs. One possible approach to monitoring exest deaths is the use barriers to simple monitoring programs. One possible approach to monitoring great depths is the use of Deep Submergence Research Vessels (DSRVs). The Woods Hole Oceanographic Institution has operated DSRV Alvin since 1964 and it has been used in a variety of disciplines. Among them, increasingly, is the investigation of the effects of pollutants on the deep-sea biota and environment. The history of Alvin, its major accomplishments, and how it is now being used in deep-sea environmental quality programs is described. (See also W80-03013) (Sinha - OEIS)

CONTINUOUS PLANKTON RECORDS: MONITORING THE PLANKTON OF THE NORTH ATLANTIC AND THE NORTH SEA, Institute for Marine Environmental Research, Plymouth (England).

J. M. Colebrook.

J. M. Colebrook.

In: 'Monitoring the Marine Environment,' Symposia of the Institute of Biology No 24, p 87-102, 1979. 11 Fig, 12 Ref.

Descriptors: *Monitoring, *Plankton, *Water pollution effects, *Environmental effects, Baseline studies, Surveys, Coasts, Resources development, *Outer Continental Shelf, North Sea, North Atlan-

tic Ocean.

Relationships between plankton and environment have been presented to provide examples of the kinds of relationship that are found and to illustrate some of the problems involved in their interpretation. There has been a marked improvement in techniques of data acquisition in recent years, particularly in the field of satellite observations, and there has been a considerable improvement in the availability of data relating both to historical series and to current observations. These trends imply that there is ample scope for further work along these lines which could provide the bases for more refined interpretations of the relationships between plankton and environment. As the environment is in a state of continuous change, the existence of a transient phase can complicate the relationships between concomitant values of input and response. In addition, plankton populations obviously exhibit persistence, for periods at least related to their generation times, and this imposes certain characteristics on sets of observations expressed as timeseries. Given the limitations in the observational data, these problems can be solved only by the series. Given the limitations in the observational data, these problems can be solved only by the development of models of the processes involved. (See also W80-03013) (Sinha - OEIS) W80-03018

THE MONITORING OF SUBSTANCES IN MARINE WATERS FOR GENETIC DAMAGE,

University College of Swansea, (Wales). Dept. of

Generos.
J. M. Parry, and M. A. J. Al-Mossawi.
In: 'Monitoring the Marine Environment,' Symposia of the Institute of Biology No 24, p 103-113, 1979. 1 Fig. 6 Tab, 6 Ref.

nitoring, *Genetics, *Water pollution effects, *Environmental effects, Baseline studies, Chemical wastes, Coasts, Resources development, *Quter Continental Shelf, Mutagenic ents, Mytilus edulis

The use of the marine environment as a sink for the disposal of chemicals both deliberately and accidentally suggests that at least a fraction of the living organisms found in the seas and oceans may be exposed to potentially mutagenic agents. Such exposure may result in changes in the genetic architecture of marine populations and if such agents enter food chains they may lead to the unwittine exposure of human populations. The agents enter toou chains they may lead to the unwitting exposure of human populations. The assay of the seas and oceans for the presence of mutagenic chemicals can be performed in two fun-damentally different ways. One method involves chemically analysing ocean samples in order to identify constituent chemicals which may then be individually tested for mutagenic activity. The second approach involves the collection of ocean samples, concentration of the constituents, and the exposure of the resulting concentrate to a range of mutagenic screening systems. An assay system has been developed based upon the extraction of tis-sues derived from the mussel Mytilus edulis and sues derived from the mussel Mytilus edulis and the screening of these extracts for mutagenic activity using a number of microbial indicator species. Although results demonstrate the presence in muscles of chemicals which cause mutation in microbes, they provide no direct information on the potential of these chemicals to produce similar changes in the cells of higher organisms. The evaluation of their potential hazards will require the use of a range of test systems of more direct relevance to the organisms of concern. (See also W80-03013) (Sinha - OEIS)

MONITORING WHALE AND SEAL POPULA-

British Antarctic Survey, Cambridge (England). R. M. Laws.
In: 'Monitoring the Marine Environment,' Symposia of the Institute of Biology No 24, p 115-140,

1979. 3 Fig, 2 Tab, 88 Ref.

Descriptors: *Monitoring, *Mammals, *Water pollution effects, *Oil pollution, Environmental effects, Resources development, Baseline studies, Antarctic, *Outer Continental Shelf, Whales, Seals, Southern Ocean

Large-scale oil exploration and exploitation in in-Large-scale oil exploration and exploitation in in-shore and offshore areas is under way, and large industrial plants producing noxious effluents are being established in areas where they could affect marine mammal populations. Even the Antarctic is not immune. So far there is no evidence that not immune. So far there is no evidence that marine mammals are seriously affected by oil-spills but the less obvious effects of disturbance, such as involved and the expense, the immediate need is for further coordination of efforts, the continuation and strengthening of projects already in operation. for further coordination of efforts, the continuation and strengthening of projects aiready in operation, and the establishment of pilot projects to develop new techniques. Methods need to be standardized and calibrated and arrangements for storage and retrieval of data improved because records must be longer than a single, worker's cares (See also longer than a single worker's career. (See also W80-03013) (Sinha - OEIS)
W80-03020

BIOLOGICAL MONITORING AROUND AN OIL REFINERY,
Imperial Coll. of Science and Technology, London

Imperiat Coll. of Science and Technology, London (England). Dept. of Botany.
D. H. Dalby, E. B. Cowell, and W. J. Syratt.
In: 'Monitoring the Marine Environment,' Symposia of the Institute of Biology No 24, p 141-152, 1979. 3 Fig. 2 Tab, 9 Ref.

Descriptors: *Monitoring, *Oil pollution, *Water pollution effects, *Environmental effects, Ecosys-

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects Of Pollution

tems, Baseline studies, Resources development, *Outer Continental Shelf, Norway, Oil refineries.

ane approaches used in the biological monitoring studies carried out by ecologists of the British Petroleum Company at the Rafinor oil refinery at Mongstad on Fensijord, 50 km NNW of Bergen, Norway are described. Some conclusions reached in regard to marine pollution are as follows: (1) if biological monitoring is amplouad. The approaches used in the biological mon biological monitoring is employed, recording should be quantitative and in such a form that the should be quantitative and in such a form that the data can be treated statistically; (2) variations in species abundance on rocky shores are often considerable from year to year, and these must be allowed for in assessing the magnitude of possible contamination; (3) no monitoring study of this kind should be carried out in a vacuum without a fairly full understanding of the general ecological processes taking place in the natural environment; and (4) biological data become more useful when the species studies are employed in a kind of hioassay. species studies are employed in a kind of bioassay and restricting the recording to rather few species of known tolerance and response. (See also W80-03013) (Sinha - OEIS) W80-03021

MONITORING RADIOACTIVITY IN THE MARINE ENVIRONMENT, Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological

Lab. N. T. Mitchell.
In: 'Monitoring the Marine Environment,' Symposia of the Institute of Biology No 24, p 153-170, 1979. 1 Fig. 5 Tab, 21 Ref.

Descriptors: *Monitoring, *Radioactivity, *Environmental effects, *Waste disposal, *Water pollution effects, Nuclear powerplants, Coasts, Estuaries, Resources development, *Outer Continental Shelf, United Kingdom

An account of methods used in the UK to monitor the effects of controlled radioactive waste disposal from the generation of nuclear power on the marine environment is presented. Monitoring occupies an especially important role within the con-trol structure for ensuring the safe disposal of radioactive waste, and its treatment explains this radioactive waste, and its reatment explains into role and the use to which it is put. Marine environmental monitoring in the UK is essentially source-related and, designed and organized along critical path lines, provides a comprehensive surveillance system of the effects of operation of a large nuclear power programme. Monitoring is closely integratded with research programmes which also feed into the overall control system and so ensure that maxi-mum information is gained from the effort availa-ble. (See also W80-03013) (Sinha - OEIS)

MONITORING THE EFFECTS OF DOMESTIC AND INDUSTRIAL WASTES, Clyde River Purification Board, Glasgow (Scot-

A. J. Newton, A. R. Henderson, and P. J. Holmes. In: 'Monitoring the Marine Environment,' Symposia of the Institute of Biology No 24, p 171-179,

Descriptors: *Monitoring, *Domestic wastes, *Industrial wastes, *Water pollution effects, Environmental effects, Baseline studies, Resources developmental effects, Resources ment, *Outer Continental Shelf, Ocean dump-

The marine environment supports a wide variety of human activities including fishing and mariculor numan activities including insting and maricul-ture, commerce and transport, mineral exploita-tion, recreation, and waste disposal. All these ac-tivities have clear biological implications; howev-er, it is on the coastal ecosystems adjacent to major et, it is of the coastal ecosystems agjacent to major centres of population that the impact of such activ-ities, particularly waste disposal, is most pro-nounced. In order to prevent, reduce, or at least contain pollution by domestic and industrial ef-fluents, the statutory authorities have had to embark on programmes of monitoring and research so that water quality criteria can be defined and the maximum permissible levels of pollutants estab-lished. (See also W80-03013) (Sinha - OEIS)

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W80-03023

MARINE WILDLIFE CONSERVATION IN

THE COASTAL ZONE,
Nature Conservancy, Abbots Ripton (England).
Monks Wood Experimental Station.

R. Mitchell.
In: 'Monitoring the Marine Environment,' Symposia of the Institute of Biology No 24, p 181-193,

Descriptors: *Monitoring, *Conservation, *Coasts, *Water pollution effects, Baseline studies, Environmental effects, Resources development, *Outer Continental Shelf. British Isles.

The necessity to develop a strategy for marine wildlife conservation in British coastal waters is in large part a reaction to the many conflicting activities in this zone which seem to grow both in type and magnitude, and in the area which they affect. The basis of a possible strategy for marine wildlife conservation in the littoral and shallow sublittoral areas of Britain's coastal zone is described. Survey, surveillance, and monitoring are discussed in relation to this strategy. The basic and inevitable con clusion is that enormous resources are needed both to fund all the tactical and strategic research required and to manage and maintain an adequate marine conservation strategy. (See also W80-03013) (Sinha - OEIS) W80-03024

THE DEVELOPMENT OF WATER QUALITY CRITERIA FOR AMMONIA AND TOTAL RE-SIDUAL CHLORINE FOR THE PROTECTION OF AQUATIC LIFE IN TWO JOHNSON COUNTY, KANSAS STREAMS,

Kansas Water Resources Research Inst., Manhat-

R. H. Hazel, C. E. Burkhead, and D. G. Huggins R. H. Hazzi, C. E. Burknead, and D. C. Huggins. Available from the National Technical Information Service, Springfield, VA 22161 as PB80-139561, Price codes: A08, in paper copy, A01 in microfiche. Project Completion Report, December 1979. 156 p. 26 Fig. 33 Tab, 86 Ref, 6 Append, OWRT A-088-KAN(1).

Descriptors: *Kansas, *Ammonia, *Chlorine, *Bioassay, *Water quality, Shiners, Sunfishes, Bass, Fish toxins, Crayfish, Benthos, Aquatic animals, Aquatic drift, Catfishes, Toxicity, Sewage effluents.

Mill Creek and Cedar Creek in Johnson County, Kansas, were sampled monthly from December 1977 through May 1979 to determine water quality data for the streams. Also studied were toxicity levels for selected stream fauna and fauna response to artificially stressed stream conditions. From the data, water quality criteria for ammonia and total data, water quality criteria for ammonia and total residual chlorine (TRC) were developed. Both streams flow in a northerly direction and drain into the Kansas River, however, Mill Creek receives sewage treatment plant effluents while Cedar Creek does not. At each sampling site three samples were taken; one acid fixed for ammonia analysis, one for bacteriological testing, and one for other parameters such as pH, hardness, alkalinity, conductivity, and turbidity. Other on-site measurents were also made such as temperature and ments were also made such as temperature and dissolved oxygen. Species used for the 96 hour acute toxicity test for ammonia and TRC include the orange throated darter, the red shiner, crayfish, and the riffle beetle. Bluegill sunfish were observed between the two test streams. Due to the sewage discharges Cedar Creek was much healthier with discharges Cedar Creek was much healthier with greater aquatic life diversity and low concentrations of pollutants. The orange throated darter was the most sensitive species to ammonia and the red shiner the most sensitive to TRC. Stream stress tests showed that the tested fish were more sensitive to stream stress. Maximum safe levels for ammonia and TRC were determined to be 0.07 mg/l and 0.02 mg/l respectively as 24 hour averages. (Seigler-IPA) W80-03082

DIATOM AND CHRYSOPHYCEAN CYST PROFILES IN SEDIMENT CORES FROM

TWO LINKED BUT CONTRASTING WELSH LAKES, University Coll. of North Wales, Bangor. School

Officeristy Con.
of Plant Biology.
J. K. Elner, and C. M. Happey-Wood.
British Phycological Journal, Vol 13, No 4, p 341-360, 1978. 7 Fig. 4 Tab, 60 Ref.

Descriptors: *Paleolimnology, *Sedimentology, *Sampling, *Trophic level, History, Sediments, Oligotrophy, Eutrophication, Cores, Lake Padarn, North Wales, Lake Peris, Chrysophyta, Diatoms, Analytical techniques, On-site investigations,

Wales.

Llyn Padarn and Llyn Peris, two small North Wales river-linked lakes, originally formed a single larger lake. Today they contain two contrasting algal communities. The diatom and chrysophycean cyst sequence found in long sediment cores from these lakes was studied to determine the historical extent of their trophic differences. Llyn Padarn 4.75 m long core represents c. 900 years, while Llyn Peris 2.1 m long core represents c. 900 years. Between 6,000 and 2,200 B.P., Llyn Padarn sa cid-oligotrophic; about 2,200 years ago it became enriched. Asterionella formosa was a predominant diatom at that time. C. 2,000 B.P., Llyn Peris sediments were characterized by centric diatoms similar to those found in the Llyn Padarn sediments between C. 2,000 B.P. and the present. C. 200 B.P., Llyn Peris sediments began to show chemical changes traceable to extensive copper and slate mining near the lake. At that time Chrysophyceae became dominant in Llyn Padarn. A statistical analysis method is described for determining the precision of counting of the sediment samples. The most efficient counting and sampling procedure involves taking a single sediment sample from a depth horizon, preparing two replica slides, and counting the entire area of each slide. Comparison of vertical variation greatly exceeds horizontal variation; teal variation greatly exceeds horizontal variation; of vertical and horizontal distributions of these siliceous algae in replica sediments shows that ver-tical variation greatly exceeds horizontal variation; this proves that the sediment core sequence reflects changes in composition through time rather than variations in horizontal algal distribution. (Harris-Wiscognia)

SORPTION OF PHOSPHATE BY DANISH LAKE SEDIMENTS, Copenhagen Univ., Hillerod (Denmark). Freshwater-Biological Lab.

O. S. Jacobsen. Vatten, Vol 33, No 3, p 290-298, 1977. 10 Fig, 3 Tab, 17 Ref.

Descriptors: *Sorption, *Absorption, *Adsorption, *Phosphates, Denmark, Trophic level, Sedimentwater interfaces, Isotherms, Lakes, Mud-water interfaces, Langmuir isotherm, Freundlich isotherm, Phytoplankton, Cycling nutrients.

Sediment samples were collected during winter 1975-1976 from eight Danish lakes of different trophic level. Analyses of the sediments were carried out for purposes of studying sorption isotherms and their relationships to sediment composition. Results of the experiments confirm that the sorption mechanism in most sediments is a very ranid reaction. Changes in external concentrations. sorption mechanism in most sediments is a very rapid reaction. Changes in external concentrations of about 1 mg phosphorus/1 occur within 4-8 hrs. Iron-oxid-hydroxids in active-state sediments are the main factor influencing the sorption capacity. The highest level of sorption was obtained in experiments with oxidized mud and lake water, and pH had the most influence on sorption capacities. H had the most influence on sorption capacities. In reduced mud only low sorption capacities were found as a result of reduction in the active iron content of the sediment. In organic and iron-poor sediments low sorption capacities or none at all were obtained. Sorption to iron-oxid-hydroxids is a naximum of sorption sites. Mathematically it can best be described by a Langmuir isotherm. Sorption to organic matter, clay, minerals, and inorganic surfaces must be regarded as adsorption, best described by a Freundlich isotherm. For natural sediments the ratio between chemosorption and adsorption provides data for selecting the correct isotherm. (Harris-Wisconsin) W80-03102

SPATIAL VARIABILITY OF PHYTOPLANK-TON BIOMASS IN THE SURFACE WATERS OF LONG ISLAND, State Univ. of New York at Stony Brook. Marine Sciences Research Center. J. F. Lekan, and R. E. Wilson. Estuarine and Coastal Marine Science, Vol 6, No 3, p 239-251, 1978, 8 Fig, 8 Ref.

Descriptors: *Phytoplankton, *Biomass, *Long Island Sound(NY), *Spatial distribution, Chlorophyll, Analytical techniques, Correlation analysis, Statistical methods, Temperature, Salinity, Wave-

The relative importance of interactions among various biological and physical processes is analyzed in terms of affects of these differences on varying sizes (intermediate to large-scale) of in-vivo chlorophyll-a observed in surface waters along a 192 km transect through eastern Long Island Sound and nearby coastal waters. Statistical analysis of records of chlorophyll-a, temperature and salinity confirms the existence of small structure in chlorophyll-a and larger structure in temperature and salinity. Cross-covariance analysis indicates that there is no correlation between the chlorophyll-a salinity. Cross-covariance analysis indicates that there is no correlation between the chlorophyll-a structure and that of temperature and salinity. The power spectra for these three variables are similar at wavelengths of 5-20 km, suggesting that structure at these wavelengths is determined by physical processes. At wavelengths shorter than 5 km the chlorophyll spectrum exhibits a slope of approximately -1, while temperature and salinity have steeper slopes (-5/3). Power spectra for temperature and salinity steepen at wavelengths greater than 20 km, reflecting the large scale changes in these parameters associated with the transition from estuarine to coastal waters. Chlorophyll-a structure at these wavelengths is related to the distribution of nutrients, especially ammonium. (Harris-Wisconsin) (Harris-Wisconsin) W80-03104

A DISCRETE MODEL FOR THE STUDY OF A LAKE,

Laboratories d'Automatique, Saint Martin D'Heres (France). S. Gentil.

Applied Mathematical Modeling, Vol 3, No 3, p 193-198, 1979. 6 Fig, 1 Tab, 11 Ref.

Descriptors: *Lakes, *Simulation analysis, *Computer models, *Eutrophication, Model studies, Mathematical models, Equations, Phytoplankton, Zooplankton, Organic matter, Trophic level, Ecology, Nutrients, Aquatic environment, Predation, Epilimnion, Cycling nutrients, Computer programs

An original discrete lake model focuses on cultural eutrophication (mineral and organic inputs) effects on a lake epilimnion, especially phytoplankton. The model is based on prey-predation formulation and material balances. State variables include algae, herbivorous zooplankton, organic materials, algae, herbivorous zooplankton, organic materials, an internal materials, and nutrients. It takes into account environmental biological capacity and the mineralization process. The system consists of several feedback interconnected loops: it is a multivariable, nonlinear, stationary system. The overall program is composed of 76 statements. Model behavior is tested through various simulations which study the influence of certain parameters and pollution input modification. Pure delay in zooplankton reproduction is introduced. (Danovich-Wisconsin) W80-03106

MEASUREMENTS OF MINERALIZATION OF PHYTOPLANKTON DETRITUS IN AN OLIGO-

TROPHIC LAKE, Cornell Univ., Ithaca, NY. Section of Ecology and Systematics.

J. J. Cole, and G. E. Likens.

ology and Oceanography, Vol 24, No 3, p

541-547, 1979. 4 Fig, 1 Tab, 32 Ref.

Descriptors: *Oligotrophy, *Phytoplankton, *Bacteria, *Degradation(Decomposition), *Microbial degradation, *Mirror Lake(NH), Detritus, Microorganisms, Respiration, Tracers, On-site tests, Onsite investigations, Analytical techniques, Carbon, Size, Biochemistry, Particle size, Enzymes, Microbiology, New Hampshire, Measurement.

biology, New Hampshire, Measurement.

Phytoplankton mineralization, or decomposition, in Mirror Lake, a small oligotrophic lake in New Hampshire, is largely due to bacterial activity. Mineralization activity is the process which produces (C-14/CO2 from C-14 labeled phytoplankton bottle and (C-14/CO2 trapping system design provides a method for measuring mineralization rates in microbial communities under in situ temperatures and dissolved gas concentrations without extreme experimental manipulations. From 3-9% of the carbon photoassimilated in 72 h in oligotrophic Mirror Lake is returned to the inorganic carbon pool over an equal period by a mineralization agent in the water column. At least 25%-30% of the particulate phytoplankton detritus is mineralized to CO2 over 50 h. Differential filtration studies indicate the mineralization agents are quite small. 95% of unfiltered activity passed 0.4 micro m Millipore filters; many small bacteria are actually trapped inside cellulose-acetate Millipore filters. Since 86% of the unfiltered mineralization activity does not pass 0.1 micro m Sartorius filters, the bulk of the mineralization activity stems from microorganisms (particulate) rather than soluble enzymes (dissolved material). Mineralization activity correlates with very small particles, is inhibited by penicillin-chlorapphenicol, and is completely try correlates with very small particles, is inhibited by penicillin-chlorapphenicol, and is completely destroyed by heat (121C) or Formalin. Such an agent is presumably bacterial. (Danovich-Wisconsin) W80-03107

AMAZON LAKES: WATER STORAGE AND NUTRIENT STRIPPING BY ALGAE, Duke Univ., Beaufort, NC. Marine Lab. T. R. Fisher, Jr., and P. E. Parsley. Limnology and Oceanography, Vol 24, No 3, p 547-553, 1979. 1 Fig. 1 Tab, 30 Ref. NSF PCM 75-06451, OCE 76-82084.

Descriptors: *Amazon River, *Lago Janauaca, Brazil, *Water levels, *Floods, *Nutrients, Lakes, Water storage, Rainfall, Seasonal, Flood plains, Flood discharge, Chlorophyta, Algae, Cyanophyta, Growth rates, Productivity, Primary productivity, Runoff, River flow, Phytoplankton, Mixing, Chlorophyll, Ammonia.

Mixing, Chlorophyll, Ammonia.

During the rainy season, Amazon River water levels rise 10 m, flooding a broad band at least 50 km away and significantly affecting phytoplankton growth in adjacent lakes. The lakes function as a capacitor within the river system and during storage major changes in water chemistry occur due to intense biological activity. Lago Janauaca is a large shallow lake connecting with Rio Solimose (Amazon River above Rio Negro junction) by a channel 12 km long. The lake is productive (2.2 g C/sq m d), aithough low in nutrients (0.10 micro g-at nitrate/1, 0.14 micro g-at phosphates /1), and contains large phytoplankton concentrations (52 micro g/chl/). About 70% of phytoplankton (ell volume is accounted for by two green algae, Arthrodesmus and Ankistrodesmus, and blue-green Calothrix. In the nutrient-rich Rio Solimoes (12 micro g-at nitrates/1, 0.90 micro g-at phosphates/1), primary productivity is low (0.063 g C/sq m d) due to poor light penetration caused by turbidity. At the start of the rainy season in December 1976, the rising Amazon began its annual incursion into Lago Janauaca. During the first month, water levels rose 1.5 m. Horizontal variations in lake transparency and nutrient concentrations indicated view water enertation. In the mixing zone, nearly levels rose 1.5 m. Horizontal variations in lake transparency and nutrient concentrations indicated river water penetration. In the mixing zone, nearly 75% of the phytoplankton was composed of bluegreen algae such as Anabaena, Oscillatoria, and Anacystis. Nitrate and phosphate removal was virtually complete in this zone. Ammonia concentrations peaked, lagging just behind chlorophyll peaks. (Danovich-Wisconsin)

W80-03108

A COMPARISON BETWEEN THE CELL DIVI-SION RATE OF NATURAL POPULATIONS OF THE MARINE DIATOM SKELETONEMA COS-TATUM (GREVILLE) CLEVE GROWN IN DIA-LYSIS CULTURE AND THAT PREDICTED FROM A MATHEMATICAL MODEL, Skidaway Inst. of Oceanography, Savannah, GA. J. A. Yoder. Limnology and Oceanography, Vol 24, No 1, p 97-106, 1979. 5 Fig. 3 Tab, 29 Ref. NSF GA 31391.

Descriptors: *Dialysis, *Diatoms, *Cultures, *Mathematical models, *Growth rates, Regression analysis, Cytological studies, Narragansett Bay(RI), Marine algae, Phytoplankton, Population, Sea water, Temperature, Water temperature, Light intensity, Silicates, Nutrients, Ecosystems, Equations, On-site investigations, Forecasting, Rhode Island, Skeletonema costatum.

During the 1977 winter-spring phytoplankton bloom in Narragansett Bay, Rhode Island, cell division rates of natural Skeletonema costatum populations encapsulated in dialysis bags and exposed to bay water could be predicted from equations primarily formulated from batch culture studies of a single S. costatum clone. Equations incorporating only temperature and light intensity effects explain cell division rates; these parameters account for 90% of the observed variation. However, predictions based solely on temperature ever, predictions based solely on temperature levels and light intensity tend to overestimate ob-served division rates. When an expression incorpo-rating the combined effect of silicate concentration, light intensity and temperature on cell division rate is used, the relationship gives better results. Terms not included in the model are light sults. Terms not included in the model are light acclimation, temperature-dependence of K-s, and short changes in bay water nutrient concentrations such as dissolved inorganic nitrogen and phosphorus. Results tend to support the validity of an autecologival approach to studying marine phytoplankton dynamics. At weekly intervals January-blankton samples were collected from Narraganett Bay, encapsuled in dialysis bags, incubated in flowing seawater for 2-5 days at two different light levels, and S. costatum cell division rate was determined. (Danovich-Wisconsin)

FUNCTIONALLY DISTINCT CLASSES OF COMPLEX PHOSPHORUS COMPOUNDS IN

COMPLEX PHOSPHORUS COMPLOSING ALLAKE WATER,
Michigan State Univ., Hickory Corners. W. K.
Kellogg Biological Station.
D. A. Francko, and R. T. Heath.
Limnology and Oceanography, Vol 24, No 3, p
463-473, 1979. 5 Fig. 1 Tab, 35 Ref, EPA 10160LICE PRO1024

Descriptors: *Orthophosphate, *Chromatography, *Twin Lakes(OH), *Crazy Eddie Bog(OH), *Phosphorus compounds, Eutrophication, Phosphorus, Lakes, Light, Light intensity, Phosphates, Phytoplankton, Nutrients, Cycling nutrients, Chemical reactions, Water chemistry, Water, Bogs, Fractionation, Ultraviolet radiation, Anion exchange, Enzymes, Ohio.

Chromatographic results from two eutrophic lakes, East and West Twin Lakes, and a humic bog, Crazy Eddie Bog, in northeastern Ohio suggest that phosphate is released from complex phosphorus compounds and made available to planktonic organisms by two distinct modes. One release mode is dependent on phosphatase activity and independent of incident light intensity. The other functional compound class, those insensitive to phosphatase activity, release orthophosphate simultaneously on exposure to sufficient doses of sunlight. Classes are mutually exclusive and account for all the filtrable complex phosphorus compounds in the lakes. The lakes contain numerous low molecular weight compounds which are resistant to low-dose ultraviolet (UV) irradiation but readily release orthophosphate upon treatment with alkaline phosphatase. Humic bog filtrable phosphorus compounds are predominately high

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molecular weight, cochromatograph with yellow acids in each fractionation procedure, and resist enzyme hydrolysis but release orthophosphate upon irradiation with low UV light doses. The UV phosphorus bound to material sensitive to UV light was released as othrophosphate within 3 h, sugnation to hydrolysis please by smilicht is much processed to the processed of the control of t was released as othrophosphate within 3 h, sug-gesting the phosphate release by sunlight is impor-tant in phosphorus dynamics in systems predomi-nated by UV-sensitive compounds. Filtrable phos-phorus compounds were fractionated by anion-exchange and gel-filtration chromatography. (Dan-ovich-Wisconsin) W80-03110

FIREFLY ASSAY OF ADENINE NUCLEO-TIDES FORM ALGAE: COMPARISON OF EX-TRACTION METHODS,

Stockholm Univ., Sweden. Inst. of Botany. C. M. Larsson, and T. Olsson. Plant and Cell Physiology, Vol 20, No 1, p 145-155. 1979. 1 Fig, 4 Tab, 38 Ref.

Descriptors: *Algae, *Adenine nucleotides, *Analytical techniques, *Evaluation, Biochemistry, Cytological studies, Assay, Firefly luciferase, Laboratory tests, Plant physiology, Energy, Methodology, Testing procedures, Metabolism, Light, Darkness, Measurement, Buffering.

Six different methods for extraction of adenine nucleotides from algae were evaluated: Tris-buffer, ethanol, chloroform, sulfuric acid, trichloroacetic acid (TCA), and perchloric acid (PCA). With samacid (TCA), and perchloric acid (PCA). With sampling times in the order of seconds, extraction in-situ with TCA or PCA gives the highest total extraction in combination with highest ATP pro-portions, that is, high energy charges and ATP/ ADP ratios. High (ATP+ADP+AMP) yields in-dicate complete release of adenine nucleotides from algae. Methods resulting in high energy charges give lower variabilities of ATP determina-tions than other methods indicating fast inactivacharges give lower variationities of A17 determina-tions than other methods indicating fast inactiva-tion of adenine nucleotide metabolism. Methods resulting in high energy charges also give better time resolution in dark-light transitions than other methods. Extraction of illuminated algae in-situ with the different methods results in great variations between ATP, ADP, and AMP proportions ations between AIP, ADP, and AMF proportions while adenine nucleotide sum varies less. Trisextraction performed by sample withdrawal is much more efficient than when performed in-situ due to high initial concentration and extraction medium temperature. Experimental organisms and activation activation and activation activation and activation activation activation activation activation activation activation and activation medium temperature. Experimental organisms were Anacystis nidulans, Euglena gracilis, Chloriella kessleri and Scenedesmus obtusiusculus. Adenine nucleotides were determined by firefly luciferase assay. (Danovich-Wisconsin)

SEASONAL CHANGES IN THE STANDING CROP OF AN EPILITHIC ALGAL POPULATION ON THE NORTH SHORE OF GREAT SLAVE LAKE.

Canada Environmental Service, Yellowknife (Northwest Territories).

Canadian Journal of Botany, Vol 57, No 1, p 17-22, 1979. 2 Fig, 3 Tab, 31 Ref.

Descriptors: "Algae, "Standing crops, "Great Slave Lake, Canada, "Seasonal, Population, Densi-ty, Epilimnion, Diatoms, Beological distribution, Chrysophyta, Chlorophyta, Cyanophyta, Euglena, Aquatic microorganisms, Speciation, Nutrients, Alkalinitv, Distribution

Alkalinity, Distribution.

 $\mathsf{I}\mathsf{M}\mathsf{L}$

Epilithic algal populations on the north shore of Great Slave Lake, Canada, studied June 1975-November 1976, increase rapidly in May immediately after disappearance of ice, show only small fluctuations during the summer and wane during Octo-ber. Great Slave Lake is the second largest lake in northern Canada with 28,800 sq km total area. It has 450 km maximum length and 600 m maximum depth. Rocks on the north shore are covered with depth. Rocks on the north shore are covered with large Ulothrix zonata (Chlorophyta) growths. A total of 187 microscopic algal species were recorded: 142 Bacillariophyta, 28 Chlorophyta, 10 Cyanophyta, and seven others. Predominant diatom species are Gomphonems olivaceum, G. ventricosa, Fragilaris capucina, and Cymbella ventricosa. The

most commonspecies are Oscillatoria limosa, Dinobyron bavaricum, and Euglean. Microsopic algal density reaches peak abundance (2 billion cu micro m/sq cm) irregularly throughout the growing season. However, filamentous algae, mainly Ulothrix zonata, reaches maximum densities (60 mg/sq cm dwt) during July. Common epilithic algae in the east arm of the lake include Tabellaria flocculosa, Rhopalodia gibba, Cymbella angustata, C. microcephala, Anomoeneis vitrea, Achnanthes minutissima, and Ulothrix zonata. Algal densities are considerably less than those on the north shore due to lower nutrient and higher alkalinity levels. Maximum abundance for microsopic and filamentous algae are 1.05 billion cu micro m/sq cm and 4.1 mg/sq cm, respectively. (Danovich-Wisconsin) W80-03112

EFFECT OF GROWTH IRRADIANCE ON THE MAXIMUM PHOTOSYNTHETIC CAPACITY OF WATER HYACINTH (EICHHORNIA CRAS-SIPES (MART.) SOLMS),

Southern Weed Science Lab., Stoneville, MS. D. T. Patterson, and S. O. Duke. Plant and Cell Physiology, Vol 20, No 1, p 177-184, 1979. 4 Tab, 25 Ref.

Descriptors: "Water hyacinth, "Light intensity, "Photosynthesis, "Adaptation, "Irradiance, "Plant physiology, Oxygen, Light, Laboratory tests, Stomata, Resistance, Leaves, Chlorophyll, Proteins, Statistics, Growth rates, Plant growth, Transpiration, Age.

In laboratory experiments water hyacinth adapts photosynthetically to high irradiance; this adaptation is limited to expanding leaves and younger leaves. Both short- and long-term high irradiance effects on photosynthetic capacity are manifested through increases in mesophyll conductance, soluble protein content and specific leaf weight. Maximum cholocombetic seatered. Documents mum photosynthetic rates and low oxygen enhancement effects indicate that the water hyacinth possesses the C3 photosynthesis pathway. Increased irradiance during growth results in greater light-saturated photosynthetic rates. In air containlight-saturated photosynthetic rates. In air containing 21% oxygen maximum photosynthetic rates are 14, 29, and 34 mg CO2/sq dm h for plants grown in artificial light at 90 and 750 micro E/sq m sec and full sunlight, respectively. Photosynthetic rates in 1% oxygen are 50% greater than rates in normal air indicating photorespiration. Variations in mesophyll conductance could account for 91% of the variations in light-saturated photosynthetic rates. Variations in protein content or specific leaf weight could account for 75% of the variation in weight could account for 7% of the variation in photosynthetic rate. Stomatal and mesophyll conductances in old leaves are unaffected by transfer from low to high irradiance. However, in young expanding leaves, stomatal conductance significantly decreases by transfer while mesophyll conductance significantly decreases by transfer while mesophyll conace significantly increases. (Danovich-Wis-

ATP AS A MEASURE OF LIVING PHYTO-PLANKTON CARBON IN ESTUARIES. Quebec Univ., Rimouski. Dept. of Oceanography. M. Sinclair, E. Keighan, and J. Jones. Journal of the Fisheries Research Board of Canada, Vol 36, No 2, p 180-186. 1979. 5 Fig, 1

Descriptors: *Phytoplankton, *Carbon, *St. Law-rence Estuary, *Analytical techniques, *ATP, Bio-mass, Estuaries, Measurement, Chlorophyll, Cyto-logical studies, Regression analysis, Heterotrophy, Spatial distribution, Bacteria, Evaluation, Plank-

Comparisons are made between living phytoplank-ton carbon (C) estimated by ATP and cell volume transformation methods on phytoplankton in the Lower St. Lawrence Estuary. In high biomass samples, greater than 10 micro g C/1 by cell volume transformation, both methods agree. In low biomass samples, the cell volume transformation method seriously underestimates C relative to the ATP methods. ATP estimates may be high due to contamination by animal and bacterial ATP. In 14 of 18 samples, estimated microzooplankton con-

tamination is 3% of ATP-derived C and in one sample 19%. ATP accuracy as a measure of living phytoplankton C in general is debatable, but in estuaries in which nutrient limitation is negligible, it is a moderately accurate estimate when phyton is a moderately accurate estimate when phyto-plankton biomass is medium to high (1 micro g chlorophyll a/l). In the Lower St. Lawrence, unless exceptionally high bacterial biomass is pres-ent, heterotorphic contamination is not large. Considerable variability with depth and time is ob-served in the estimated carbon/chlorophyll-a ratio, especially during high biomass when ATP-derived phytoplankton C is reliable. The variable ratio suggests the inapplicability of using a constant ratio for estimating C from chlorophyll a, or of using chlorophyll regression analysis on particulate C to estimate the carbon/chlorophyll a ratio, in this environment. (Danovich-Wisconsin) W80-03115

NOTES ON THE PHYTOPLANKTON PERIOD-ICITY OF ROSTHERNE MERE, CHESHIRE,

Biological Association, Ambleside Freshwater (England). C. S. Reynolds. British Phycological Journal, Vol 13, No 4, p 329-335, 1978. 1 Fig. 1 Tab, 15 Ref.

Descriptors: *Rostherne Mere, *Phytoplankton, *Succession, *Algae, Dominant organisms, Sedi-ments, Sampling, Microcystis aeruginosa, Cera-tium, Diatoms, Cryptophyta, Anabaena, Life histo-ry studies, England.

Sedimentary samples of 0-4.5 columns were col-lected intermittently 1967-1977 from Rostherne Mere, one of the largest and deepest lakes of the Shropshire-Cheshire Plain in England. Seasonal Shropshire-Cheshire Plain in England. Seasonal phytoplankton succession and interactions between the two dominant algae, Microcystis and Ceratium, were studied. Microcystis aeruginosa was overwhelmingly dominant for five summers; Ceratium dominated in two of the remaining years; diatoms and Anabaena spp. were the most dominant in the other year. Algal biomass was generally low during the first half of the year. Periodicity of Microcystis aeruginosa has been shown as closely related to the annual cycle of stagnation and destratification, while the high nutrient status of the water and the ability of vegetative colonies to descend and over-winter on the bottom muds are factors contributing to its successful growth in the factors contributing to its successful growth in the lake. In 1971 and 1975 Ceratium not only replaced Microcystis but growth culminated in crops com-parable to the largest ones of Microcystis. The maxima of these algae in seven years were recipro-cal though not necessarily inversely correlated cal though not necessarily inversely correlated. Ceratium is able to succeed if the earlier and potentially more rapid growth of Microcystis is inhibited for any reason, including nutrient limitation or parasitic attack. When neither Microcystis nor Ceratium are abundant, the summer phytoplankton is dominated by diatoms and Anabaena. The interludes of Ceratium dominance are potentially the certification to the control of the certification testification is controlled to certification testifications in the certification of the cer tially useful for sediment stratigraphy interpreta-tions. (Harris-Wisconsin)

BIOSYNTHESIS AND RELEASE OF ORGAN-OARSENIC COMPOUNDS BY MARINE OARSENIC ALGAE

ALGAE, Scripps Institution of Oceanography, La Jolla, CA. M. O. Andreae, and D. Klumpp. Environmental Science and Technology, Vol 13, No 6, p 738-741, 1979. 3 Fig. 3 Tab, 9 Ref.

Descriptors: *Biochemistry, *Marine algae, *Arsenic compounds, *Kinetics, *Metabolism, Arsenic radioisotopes, Nutrients, Organic compounds, Algae, Cytological studies, Coccolithopore, Phosphates, Analytical techniques, Bioaccumulation, Phytoplankton, Plant physiology, Cultures, Trac-

Arsenate uptake from seawater, organoarsenic compound biosysthesis, and release of arsenite, methyl arsonate, and dimethyl arsinate were studied in pure marine phytoplankton cultures. Marine phytoplankton actively take up arsenate at natural concentrations from its environment and regulate

Fig, 6 Tab, 26 Ref.

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cellular arsenic levels independently of phosphate cellular arsenic levels independently of phosphate concentrations over large concentration ranges. Significant differences exist between algal species, both in terms of uptake rates and type and number of compounds produced. In addition to substantial arsenic amounts strongly bound to cell structural parts, up to 12 soluble organoarsenic compounds were formed. A five day arsenate uptake experiment using Platymonas cultures and As-74 as a radioactive tracer shows that cellular arsenic content increases during the first two days, then stabiradioactive tracer shows that cellular arsenic con-tent increases during the first two days, then stabi-lizes while arsenic in the medium drops 35% from 13 nM and phosphate falls from 19 to 0.7 micro M. Large variations in phosphate concentrations does not significantly influence cellular arsenic concen-trations. Biosynthetic studies were conducted on Skeletonema costatum, Platymonas suecica, Gon-yaulux polyedra, and Cricosphaera carteri. With the exception of Crisocosphaera, all cultures incor-porated significant amounts of arsenic (13-78%). All species released substantial amounts of methyl arsonate and dimethyl arsinate into their environnate and dimethyl arsinate into their environment. (Danovich-Wisconsin) W80-03118

EFFECTS OF NUTRIENTS AND TEMPERATURE ON DECOMPOSITION OF MYRIO-PHYLLUM SPICATUM L, IN A HARD-WATER

PHYLLUM SPICATUM L. IN A HARD-WALEA EUTROPHIC LAKE, Wisconsin Univ.-Madison. Dept. of Botany. S. R. Carpenter, and M. S. Adams. Limnology and Oceanography, Vol 24, No 3, p 520-528, 1979. 3 Fig, 2 Tab, 40 Ref, NSF DEB-75-

Descriptors: "Nutrients, "Temperature, "Lake Wingra(WI), "Decomposting organic matter, "Degradation(Decomposition), "Myriophyllum spicatum, Nitrogen, Phosphorus, Environmental effects, Macrophytes, Laboratory tests, Mathematical models, Eutrophication, Deterioration, Detritus, Plant physiology, Aging(Physical), On-site investigations, Forecasting, Water temperature, Equations, Wisconsin.

Equations, Wisconsin.

Laboratory decay rate predictions of Myriophyllum spicatum shoots explain Lake Wingra, Wisconsin, field variance well, but systematically underestimates field decay rates. Temperature, phosphorus, and nitrogen effects on shoot decay were
examined in the laboratory. Equations developed
from laboratory data predicted decay in Lake
Wingra; predictions were then tested against litter
ag data. Nitrogen enrichment significantly increases the decay coefficient while phosphorus enrichment does not. Tissue nitrogen and nitrate enrichment both significantly influence the decay
coefficient. In laboratory experiments, phosphorus
is lost from tissues during decay, corroborating
with absence of phosphorus limitation. In contrast,
little nitrogen is liberated. Over condition ranges
examined, nitrogen saturation of decay rates does
not occur. Therefore, laboratory and field data
show that nitrogen content linearly corresponds to
decay rates. Decay coefficients increase with increasing temperature to 28C and then decline.
Water temperature and initial tissue nitrogen content are useful factors for predicting M. spicatum water temperature and mina tissue intogen com-tent are useful factors for predicting M. spicatum decay rates in Lake Wingra. Predictions and obser-vations are similar at low decay rates, but at high decay rates, predictions are only 60% of observed values. Inaccuracy is explained by important bio-logical differences including more rapid nitrogen accumulation by detritus decaying in the lake, probably due to greater nitrogen availability, detritus colonization rates by microbes; and inverte-brate activities. (Danovich-Wisconsin) W80-03119

EXPRESSING THE PHOSPHORUS LOADING CONCEPT IN PROBABILISTIC TERMS, National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.

Research Lab.
S. C. Chapra, and K. H. Reckhow.
Journal of The Fisheries Research Board of
Canada, Vol 36, No 2, p 225-229, February 1979. 4
Fig. 2 Tab, 9 Ref.

Descriptors: *Phosphorus, *Probability, *Nutrient loading, *Vollenweider models, *Reliability, Lim-

nology, Management, Lakes, Eutrophication, Mathematical models, Statistics, Nutrients, Fore-casting, Trophic level, Variability, Risks, Water quality, Estimating, Temperate.

Data representing 117 North Temperate Lakes were used to estimate uncertainty of a phosphorus loading model. Graphical representations demonstrate the importance of including probabilistic information in phosphorus loading calculations. Vollenweider's phosphorus loading plots predict a lake's trophic state on the basis of variables reprelake's tropnic state on the bass of variables repre-senting its phosphorus loading, morphometry, and hydrology. Plots are statistical since they represent generalizations drawn from large numbers of lakes. They are also deterministic in that a fixed predict-ed value results from any given set of independent variables. Predictions are useful estimates but models do not include information on reliability or models do not include information on reliability or prediction uncertainty. This paper quantifies the unexplained variability, or uncertainty of a phosphorus leading model. The procedure has short-comings: (1) Results are applicable only within the range of conditions represented by the data set. Climatic range is limited to the North Temperate Zone. (2) The model is based on completely mixed lake conditions: it predicts the average phosphorus concentration in a lake and does not predict temporal or spatial deviations. (3) Errors exist in model variable estimates, particularly phosphorus inflow concentration. (4) While phosphorus enrichment assumes eutrophication, other parameters (chlorophyll-a, Secchi depth, dissolved oxygen) inclinent assumes europinication, other parameters (chlorophyll-a, Secchi depth, dissolved oxygen) provide a more realistic basis for analyzing uncertainty of lake trophic state calculations. (Danovich-Wisconsin) W80-03120

AMMONIA VOLATILIZATION OF WINTER SPREAD MANURE,
Cornell Univ., Ithaca, NY. Dept. of Agricultural

Engineering.
T. S. Steenhuis, G. D. Bubenzer, and J. C.

Converse.
Transactions of the American Society of Agricultural Engineers, Vol 22, No 1, p 152-161, 1979. 6 Fig, 5 Tab, 23 Ref.

Descriptors: *Manure, *Volatility, *Ammonia, *Winter, Regression analysis, Evaporation, Physical properties, Nitrogen, Drying, Freeze-thaw tests, Dehydration, Temperature, Winds, Ureas, Nitrogen compounds, Fertilizers, Equations, Laboratory tests, On-site tests, Surface runoff, Seasonal.

Winter manure spreading reduces ammonia volatilization because wind speeds and temperature are normally lower and a large amount of manurial nitrogen is in the urea form. This paper determines parameters affecting ammonia volatilization from winter manure spreading and develops an equation to predict the effect of manure loading and environmental factors such as wind speed and tempera-ture on volatilization. Doubling wind velocity re-sults in halving the ammonia volatilization half life. Sortis in naving the ammonia volatilization hair inte-Spreading manure during low air turbulence peri-ods and incorporating it into the soil as soon as possible leads to minimum volatilization bases. Urea conversion to ammonia limits ammonia volatilization following winter spreading. Relative air humidity has no appreciable effect on volatilizanumidity has no appreciable effect on volatilization. Drying is not required for volatilization. Higher application rates increase volatilization half-life. Freezing and thawing does not increase volatilization. On 22 January 1976, a manure spreading field experiment began. Half-life for amount was 11 days assuming 30% of ammonia infiltrated into the soil shortly after ammonia infinited into the soil shorty after spreading. Temperatures during the 14 day experi-ment varied +10C to -28C with -2C average. When surface runoff occurs due to winter thaw, melt water may contain large amounts of unvolati-lized nitrogen. (Danovich-Wisconsin) W80-03122

NUTRIENT BUDGETS OF A TEMPORARY POND ECOSYSTEM, New York State Coll. of Agriculture and Life Sciences, Ithaca. Ecology and Systematics Section. J. J. Cole, and S. G. Fisher. Hydrobiologia, Vol 63, No 3, p 213-222, 1979. 3 Descriptors: *Lost Pond(MA), *Ecosystems, *Energy budget, *Cycling nutrients, *Nutrient budgets, Nutrients, Kinetics, Carbon, Shallow water, Ponds, Temporary pond stage, Nutrient transport, Seasonal, Organic matter, Organic loading, Rainfall, Primary productivity, Respiration, Seepage, Massachusetts.

Input-output budgets of organic carbon and several inorganic nutrients in temporary Lost Pond, central Massachusetts, 1974-1975 suggest that during summer months, small ponds are open systems with respect to nutrients yet closed energeti-cally. At full spring volume, Lost Pond has 3500 sq m surface area, 73 cm mean depth, and 2700 cu m cally. At full spring volume, Lost Pond has 3500 sq surface area, 73 cm mean depth, and 2700 cu m volume. The pond's watershed is 8.3 ha of uninhabited forest. Water enters the pond primarily by subsurface seepage. Typically the pond dries over the summer and fills again in late October. In December about one-third of the pond water is ice. Dissolved organic matter is lowest (3-4 mg/l) in winter and early spring and increases dramatically to a maximum value of 45 mg/l in summer dry periods. Based on the assumption that sodium inputs are balanced by exports, nutrient budgets indicate that (1) Calcium, magnesium and chloride inputs are balanced by exports and flow through the system. (2) Nitrate, phosphate and sulfate are all retained during both summers indicating nutrients may be converted to some other form by the system. (3) Dissolved organic matter is released by the system indicating the presence of an internal source. (4) Potassium is either retained or released. During summer, rainfall accounts for 21-41% of the hydrologic input. Macrophyte primary production is the major organic carbon input and heterotrophic community respiration is responsible for 84% of the organic carbon output. (Danovich-Wisconsin) Wisconsin) W80-03123

RELATIONSHIP BETWEEN PRODUCTIVITY

AND N2 (C2H2) FIXATION IN A THALASSIA TESTUDINUM COMMUNITY, State Univ. of New York at Stony Brook. Marine Science Research Center.
D. G. Capone, P. A. Penhale, R. S. Oremland, and

B. F. Taylor. Limnology and Oceanography, Vol 24, No 1, p 117-125, 1979. 3 Fig, 9 Tab, 36 Ref. NSF OCE 74-01986, OFF 72-02716 AT-40-1-4493.

Descriptors: *Nitrogen fixation, *Primary production, *Bimini Harbor, Bahamas, *Thalassia, Protion, "Bimini Harbor, Bahamas, "Inalassia, Productivity, Tidal waters, Plant groupings, Metabolism, Growth rates, Methodology, Analytical techniques, Leaves, Epiphytes, Plant populations, Plant physiology, Standing crop, Plant tissues, Plant growth, Rhizomes, Rhizosphere, Biological communities, Carbon, Bahamas.

munities, Carbon, Bahamas.

July 1976 investigations of Thalassia testidium beds in Bimini Harbor (Bahamas) concludes that nitrogen (N) fixation directly relates to productivity, providing good support for Patriquin's hypothesis. Data also suggest independence of macrophyte and its leaf epiphytes with respect to N metabolism. Standing stocks of Thalassia leaves plus epiphytes were 200 g dwt/sq m. Production assessed by the C-14 method considerably exceeds that determined by methods of Zieman and Patriquin. The latter methods determine production by leaf growth measurements and by applying an empirical formula based on leaf dimensions. Production differences are due to photosynthate utilization in other processes such as rhizome production, plant respiration and microbial N fixation in the rhizosphere. Sediment fixation constitutes the bulk of the total N fixed. N fixation in the rhizosphere provides either 12-22% (C-14 method) or 21-48% (Zieman technique) of the N requirements are small due to high carbohydrate tissue contents. N fixed in the rhizosphere contribute predominately to macrophyte carbonydrate issue contents. Nature in the intense phere contribute predominately to macrophyte production, whereas phyllosphere N fixation primarily promotes leaf epiphyte development. N fixation significantly correlates with CO2 fixation rates when all community components are considered. N fixation is important to production in Thalassia communities and the plant and its leaf epi-

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phytes may be distinct entities in terms of N and carbon metabolism. (Danovich-Wisconsin) W80-03124

BIOLOGICAL AND WATER QUALITY EF-FECTS OF ARTIFICIAL MIXING OF ARBUCK-LE LAKE, OKLAHOMA, DURING 1977, Oklahoma State Univ., Stillwater. School of Biological Sciences. D. W. Toetz.

Hydrobiologia, Vol 63, No 3, p 255-262, 1979. 6 Fig, 6 Tab, 21 Ref. OWRT A-068-OKLA(2).

Descriptors: "Water chemistry, "Water quality,
"Arbuckle Lake(OK), "Algae, "Mixing, "Destratification, Water circulation, Biomass, Chlorophyll,
Lake restoration, Lakes, Water quality control,
Respiration, Ammonia, Biochemical oxygen
demand, Chemical properties, Ecosystems, Dissolved oxygen, Thermocline, Epilimnion, Hypolimnion, Environmental effects, Secchi disks, Primany productivity, Oklahoms. mary productivity, Oklahoma

Artificial mixing decreased the ratio gross production: community respiration below unity in Arbuckle Lake, Okiahoma, 1977 and the lake ecosystem became more heterotrophic, suggesting that lakes which are not artificially mixed have lower net primary productivities than lakes which are not artificially mixed. This paper describes the effects of total lake mixing with 16 axial flow pumps, and Arbuckle Lake water quality, aleal biomass, and Arbuckle Lake water quality, algal biomass, and community metabolism. Pumping began on 1 July 1977. Mechanical pumping significantly lowered the thermocline from 9-15 m and delivered dissolved oxygen to depths normally anoxic. Pumping effects on other water quality parameters are less clear, however. Epilimnion water quality was basically the same in 1976-1977. Concentrations of basically the same in 1976-1977. Concentrations of S and Mn were below detection in both years and BOD was unchanged. Only NH3 concentration were lower in 1977. Hypolimnion water quality generally improved during 1977 when the lake was mixed. Mean NH3 and BOD concentrations decreased; Mn was unchanged but S concentrations increased. Algal biomass as chlorophyll a was about the same in 1977 as in 1976 (9 micro g/l). Secchi disc depth was also the same. Mean lake transparency ranged from 1.60-1.98 m in 1976 and from 1.62-1.88 m in 1977. Algal blooms did not occur either year. (Danovich-Wisconsin) W80-03170

POPULATION DYNAMICS AND AGE STRUC-TURE OF BOSMINA LONGIROSTRIS IN AN ACID WATER IMPOUNDMENT, West Virginia Univ., Morgantowa. Dept. of Biol-

ogy.

J. DeCosta, and A. Janicki.

JMI

In: Proceedings: Congress in Denmark 1977, Internationale Vereinigung für Theoretische und Angewandte Limnologie; Vol 20, Part 4, p 2472-2483, 1978. 3 Fig. 1 Tab, 6 Ref. A-024-WVA(2).

Descriptors: "Population, "Dominant organisms, "Crustaceans, "Acidic waters, "Cheat Lake(WV), Age, Growth rates, Growth stages, Zooplankton, Weight, Bosmina longirostris, Copepods, Biological communities, Acidity, Acid mine water, Impoundments, Biomass, Seasonal, Backwater, Dams, Size, Predation, Competition, Reproduction.

This paper examines seasonal succession of biomass This paper examines seasonal succession or oronnass and age structure of Bosmina longirostris populations in acid Cheat Lake, West Virginia and Pennsylvania, and in two less-acidic embayments, May-November 1974. Median surface pH is 4.6 for Cheat Lake and 6.0 in its backwaters. Acid co tions in Cheat Lake are due to mine drainage; data show simple zooplankton communities due to acidification. Extreme Bosmina dominance in the lake suggests that Bosmina has a competitive advantage under more acid conditions. This advantage may be due to high feeding efficiency on a reduced size range of food particles. Lack of Bosmina early dominance in backwaters results from Mesocyclops edax predation. Bosmina becomes increasingly dominant from midsummer to fall espe-cially in lake stations but less so in the two back-waters. Cyclopoids dominates early in the seak-nat lake stations but by September, Bosmina biomass peaks, at nearly 100% Crustacea less nauplii. Bio-mass dynamics are different at backwater stations. In one area, highest Bosmina biomass occurs in August. However, Bosmina backwater dominance August. However, Bosmina backwater dominance is not so striking due to the presence of M. edax. Early in the growing season, lake populations are composed primarily of large individuals; however, as reproduction rates increase, mean individual weight decreases due to large numbers of smaller individuals. At all lake stations, this low mean weight characterizes the entire summer. However, the recognition is composed of large individuals by weight characterizes the entire summer. However, the population is composed of large individuals by October-November because reproduction rates de-crease in autumn. (Danovich-Wisconsin) W80-03171

PLANKTONIC SYSTEMS AND URBAN POL-LUTION: STUDY OF PLANKTON POPULA-TIONS, (IN FRENCH).

Centre Universitaire de Luminy, Marseille (France). Lab. d'Hydrobiologie Marine. Oceanologica Acta, Vol 2, No 4, p 379-388, 1979. 35 Fig. 1 Tab, 15 Ref. (English abstract).

Descriptors: *Plankton, *Toxicity, *Sewage effluents, Phytoplankton, Zooplankton, Biological communities, Dominant organisms, Copepods, Outfall sewers, Coasts, Aquatic populations, Bioindicators, Mediterranean Sea, Marseille(France).

This paper describes a study of the distribution of This paper describes a study of the distribution of plankton populations in terms of their location with regard to the sewage outfall and of depth. A comparison is made between superficial and underlying populations. In the surface layer, zooplankton density is minimal in the immediate vicinity of the outfall, and increases towards the periphery of the surrounding basin. In the deep layer, the influence of pollution is less pronounced, and nertitic zooplankton reaches the shoreline even in the most affected area. With a light wind blowing from the East, three zones may be distinguished. The first of these which is characterized by pronounced turbi-East, three zones may be distinguished. The first or these which is characterized by pronounced turbidity and by high concentrations of carbon, extends to a distance of some 500m from the shoreline, and for more than a kilometer in the immediate vicinity of the outfall; very tolerant zooplankton (Oithona helgolandica, Acartia clausi, Clausocalanus sp., Paracalanus parvus, Oikopleura sp.) and phytoplankton species (Leptocylindus danicus, Nitzschia delicatissima, Rhizosolenia fragilissima) may be observed in this zone. In the second, transitional served in this zone. In the second, transitional zone, which is adjacent to the first species found in the most polluted area are more abundant together with others which are more sensitive to pollution (such as the copepods of the family Corycaeidae, Centropage typicus, Temora stylifera etc.). The Centropage typicus, Temora synthes exc.). The third, peripheral zone contains the above-men-tioned as well as species which are entirely absent in polluted areas and in deep water; the latter include copepods of the Pontellidae family, whose hyponeustonic behaviour is extremely sensitive to pollution, and whose presence would thus suggest that the influence of pollution is insignificant in this zone. (Deal-EIS) W80-03212

EFFECTS OF DISPERSANT USE ON SHORE

University Coll. of Swansea (Wales).

University Coll. of Swansea (Wales).

A. Nelson-Smith.
In: Chemical Dispersants for the Control of Oil
Spills, ASTM STP 659, L. T. McCarthy, Jr., G. P.
Lindblom and H. F. Walter, Eds., American Society for Testing and Materials, p 253-265, 1978. 45
Ref.

Descriptors: *Toxicity, *Bioassay, *Oil spills, Oil, Organic compounds, Environmental effects, Aquatic life, Shores, Coasts, Waterbirds, Beaches, Worms, Mollusks, Crustaceans, Plankton, Marine algae, Water pollution control, *Oil dispersants, *Dispersants, Torrey Canyon Spill, England, Milford Haven.

Damage to Cornish seashore life resulting from the chemical dispersal of oil spilled from Torrey Canyon is often taken as typical of dispersant use, although primitive mixtures were badly misapplied there. Where more modern dispersants are used with care, as in recent Milford Haven spills, serious

consequences can be avoided. All effective disperconsequences can be avoided. All effective disper-sants offer some biological hazards, especially to sedentary or planktonic filter-feeding animals, which are not revealed by short-term acute toxic-ity testing. Spilled oil should therefore be removed mechanically wherever possible. Careful spraying is recommended to prevent an oil slick reaching the shore and to protect seabird colonies. It may also be necessary on rocky or built-up amenity areas but should be avoided on coasts rarely visited by humans and distant from bird colonies. Spraying may worsen matters on sandy shores, while any form of treatment will further damage oiled salt marshes. (Deal-EIS) W80-03217

ECOLOGICAL EFFECTS OF DISPERSANTS IN THE UNITED KINGDOM,

Society of Petroleum Industry Biologists, Los Angeles, CA. For primary bibliographic entry see Field 5B. W80-03218

IMPACTS OF THERMAL ADDITION AND PREDATION ON INTERTIDAL POPULATIONS OF THE BLUE MUSSEL, MYTILUS EDULIS L.,

Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service.

Proceedings of the National Shellfisheries Association, Vol 69, p 47-53, 1979. 3 Fig, 2 Tab, 27 Ref.

Descriptors: *Mussels, *Mortality, *Heated water, Nuclear powerplants, Cooling waters, Fouling, Entrainment, Thermal effluents, Aquatic popula-tions, Dominant organisms, Crabs, Habitats, Water temperature, Predation, Monitoring.

Populations of the blue mussel, Mytilus edulis, were sampled at four locations on nearly vertical intertidal rocky surfaces from 1970 to 1977. One sampling station was adjacent to the thermal dis-charge weir of the Maine Yankee Atomic Power Co. electric generating plant, and the other stations were located at increasingly greater distances from the plant. Those mussels adjacent to the weir suffered 100% mortality in less than one year after the plant began operation, and recruitment was not observed even though the means of discharge was observed even though the means of discharge was changed to a diffuser system during the summer of 1975. Mussel populations at the other three stations declined from several thousand per square meter in 1970 to zero in 1977 although mussels continued to pose a fouling problem within the Maine Yankee plant and on nearby floats. Examination of records of organisms impinged upon the traveling screens of the Maine Yankee plant intake structure revealed a dramatic increase in green crabs, Carcinus maenas, concurrent with the decline of intertidal mussels. During the fall of 1977, an extensive qualitative examination of the rocky intertidal zone musses. Juring the fail of 1917, an extensive quani-tative examination of the rocky intertidal zone revealed that green crabs of many different sizes were very abundant and that mussels were ex-tremely scarce. Floating docks a few meters away were festooned with mussels of several size groups, including the zero age class. The increase in green crab abundance coincided with an increase in the regional surface sea water annual mean tempera-ture. (Deal-EIS) W80-03219

INITIAL TESTING OF A RECENT BIOLOGICAL MONITORING CONCEPT,

Virginia Polytechnic Institute and State Univ., Blacksburg. Center for Environmental Studies. For primary bibliographic entry see Field 5A. W80-03221

EFFECT OF DISSOLVED PETROLEUM PRODUCTS ON CARBOHYDRATE METABO-LISM OF THE LIVER OF TWO BLACK SEA SPECIES OF FISHES. PETROLEUM

Akademiya Nauk SSSR, Leningrad. Inst. Evolyut-sionnoi Fiziologii i Bokhimii. For primary bibliographic entry see Field 5B.

W80-03223

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Effects Of Pollution—Group 5C

CHIRONOMID COMMUNITIES AS WATER QUALITY INDICATORS,
Bergen Univ. (Norway). Dept. of Systematics.

O. A. Saether. Holarctic Ecology, Vol 2, p 65-74, 1979. 3 Fig, 2 Tab. 26 Ref.

Descriptors: *Mathematical models, *Bioindica-tors, *Diptera, Methodology, Biological communi-ties, Dominant organisms, Trophic level, Eutrophi-cation, Mesotrophy, Oligotrophy, Phosphorus, Chlorophyll, Oligochaetes, Hypolimnion, Aquatic insects, Arctic, Lakes, Dissolved oxygen, Chloro-

Recent mathematical indices summarizing biologi-cal communities of indicators are recapitulated. Improvements of these indices based on weighting according to width of trophic ranges of each spe-cies are suggested. Their principle deficiencies, however, are pointed out. Revised lists of charac-teristic profundal as well as littoral and sublittoral chironomids in Nearctic and Palearctic lakes show that at least 15 characteristic Theironomid species that at least 15 characteristic Theironomid species communities can be delineated, 6 in each of the oligotrophic and the eutrophic ranges and 3 in the mesotrophic range. It is proposed that these communities be lettered consecutively in the Greek alphabet from a(alpha) to o(omikron). A key to the 15 divisions based on the species associations in the profundal zone of harmonic lakes is put forward. There is very good correlation between the 15 divisions and the ratios of average total phosphorus to mean lake depth and average chlorophyll a rus to mean lake depth and average chlorophyll a to mean lake depth. The ratio of chironomids to to mean lake depth. The ratio of chironomids to oligochaetes and the distribution patterns of single species have proven useful in pin-pointing local-ized areas of pollution. The primary mechanism governing the distribution of chironomid commugoverning the distribution of chironomic committees in oligotrophic and mesotrophic lakes appears to be the availability of food materials rather than the annual hypolimnetic oxygen concentration. In eutrophic lakes the relationships between organic matter accumulation and oxygen levels are so interdependent as to be inseparable. (Deal-EIS) W80-03224

MONITORING OF CHLORINATED HYDRO-CARBONS IN BIOTA OF THE NORTH AND MIDDLE ADRIATIC COASTAL WATERS, Institut Rudjer Boskovic, Rovinj (Yugoslavia). Center for Marine Research. For primary bibliographic entry see Field 5B. W80-03226

INFLUENCE OF CERTAIN WASTE WATERS CONTAINING AMMONIA, UREA AND METHANOL ON UNICELLULAR MARINE ALGAE (IN FRENCH), Institut Romania de Recherches Marines, Constan-

For primary bibliographic entry see Field 5A. W80-03227

LEVELS OF METAL POLLUTANTS IN SEDI-MENTS AND BIOTA OF THE GULF OF TRI-ESTE: A LONG TERM SURVEY,

Trieste Univ. (Italy). Inst. of Hygiene. For primary bibliographic entry see Field 5A. W80-03228

POLLUTION MONITORING OF ELEVEN TRACE ELEMENTS IN THREE MARINE OR-GANISMS FROM SARONIKOS GULF,

Democritus Nuclear Research Center, Athens (Greece). Radioanalytical Lab. For primary bibliographic entry see Field 5A. W80-03230

TRACE METALS AND ORGANOCHLORINE RESIDUE CONTENT OF MULLIDAE FAMILY FISHES AND SEDIMENTS IN THE VICINITY OF ERDEMLI (ICEL), TURKEY,
Middle East Technical Univ., Ankara (Turkey).

Dept. of Marine Science.
For primary bibliographic entry see Field 5A.
W80-03231

THE IMPACTS OF WASTES FROM A PHOS-PHATE PLANT ON THE MARINE ENVIRON-MENT (GULF OF GABES, TUNIS) (IN

MENT (GULF OF GABES, TUNIS) (IN FRENCH),
Institut National Scientifique et Technique d'Oceanographie et de Peche, Tunis (Tunisia). Lab. de
Biologie Marine.

For primary bibliographic entry see Field 5B. W80-03232

TRACE ELEMENTS IN MESOPELAGIC AND SOME COASTAL FISH FROM THE ADRIAT-IC, Nuklearni Inst. Jozef Stefan, Ljubljana (Yugosla-

For primary bibliographic entry see Field 5A. W80-03233

STUDY OF THE DYNAMICS OF THE BENTHIC POPULATIONS OF THE BAY OF ALGIERS, PRELIMINARY RESULTS (IN

Centre de Recherches Oceanographiques et des

Centre de Recherches Oceanographiques et des Peches. Algiers (Algeria). A. Bakalem, and J-C. Romano. In: IVes journees d'etudes sur les pollutions ma-rines en Mediterranee, Commission Internationale Pour L'Exploration Scientifique de La Mer Medi-terranee, Monaco, 24-27 November 1978, Antalya, Turkey, p 335-341, 1979. 7 Tab, 2 Ref, (English abstract).

Descriptors: *Benthos, *Invertebrates, *Water pol-lution effects, Estuaries, *Domestic wastes, Sewage, Molluscs, Oligochaetes, Diversity index, Algiers, Bay of Algiers, Mediterranean, Seasons.

The dynamics of the benthic populations in the Bay of Algiers has been studied at eleven stations. Preliminary results indicated that the benthic popvaluations are not degraded at the stations close to the effluent pipes. But the influence of the pollution is discernible throughout the bay, especially at depths of less than 20 meters. The changes are most clearly observed during the summer season. Future studies are planned to correlate physical audies audies are planned to correlate physical and chemical parameters with the benthic popula-tions. The principal benthic species at the various stations are listed. (Katz-EIS) W80-03235

MONITORING OF CHLORINATED HYDRO-CARBONS IN BIOTA AND SEDIMENTS OF SOUTH ADRIATIC COASTAL WATERS, Biological Inst., Dubrovnik (Yugoslavia). For primary bibliographic entry see Field 5A. W80-03238

ACCUMULATION AND DISTRIBUTION OF HEAVY METALS IN SOME MARINE ORGAN-ISMS IN THE BAY OF IZMIR AND IN AEGEAN COASTS, Ege Univ., Izmir (Turkey). Dept. d'Oceanographi-

que Biologique.
For primary bibliographic entry see Field 5A.
W80-03239

THE EFFECT OF DDT AND HEXACHLORANE ON ASSIMILATION AND OUTFLOW OF 14C IN PHRAGMITES COMMUNIS, Akademiya Nauk URSR, Kiev. Inst. Hidrobiolo-

gii. For primary bibliographic entry see Field 5A. W80-03240

EFFECT OF CHLOROPHOS AND HEXACH-LORANE ON CELL CULTURES OF WARM-BLOODED AND COLD-BLOODED ANIMALS,

DEUODED AND COLD-BLOODED ANIMALS, Odessa State Univ. (USSR).
V. P. Tul'chinskaya, F. S. Zambriborshch, I. I. Fal'kova, S. Y. Dyatlov, and T. V. Mishchenko. Hydrobiological Journal, Vol 14, No 4, p 80-85, 1978. 3 Fig, 2 Tab, 17 Ref.

Descriptors: *Pesticide toxicity, *Cytological studies, Embryonic growth stage, Mode of action, Bioassay, Growth rates, Marine fish, Animal physiol-

ogy, Animal metabolism, Bioindicators, *Chlorophos, *Hexachlorane.

A study has been made of the effect of pesticides A study has been made of the effect of pesticules (chlorophos and hexachlorane) on transplantable human RH kidney cells and initially trypsinized cultures of chick embryo fibroblasts and the gonads of the round goby, Neogobius melanostomus. The threshold concentrations exerting a toxic effect on the cells are determined, and the influence of the toxicants on the growth and proliferation of Pul cells and case the invitation of the cells are on the growth and proliferaence of the toxicants on the growth and prolitera-tion of RH cells and on their mitotic activity is established. Data are presented on the comparative sensitivity of cells of the gonads of sea fishes and of members of the family Gobiidae of chlorophos and hexachlorane. In connection with the fairly high sensitivity of the cells of sea fishes to pesticites consideration is given to the possibility of using cell cultures to determine the permissible threshold concentrations of pesticides in commercially exploited items. (Deal-EIS)

CONCENTRATION OF THE HERBICIDE 2,4-D BY SOME HIGHER WATER PLANTS, Kharkov Vodokanalniiproekt Inst. (USSR). For primary bibliographic entry see Field 5B. W80-03243

SOME OBSERVATIONS ON THE REPRODUCTION AND EMBRYONIC DEVELOPMENT OF FIVE SPECIES OF FISH KEPT IN EXPERIMENTAL RADIOACTIVE WATER BODIES, Akademiya Nauk SSSR, Moscow. Inst. of Evolutionary Morphology and Animal Ecology. For primary bibliographic entry see Field 5A. W80-03244

THE EFFECT OF HYPOXIA AND ANOXIA ON THE SPECIES AND NUMBERS OF BLACK SEA POLYCHAETA,

Institute of Biology of the Southern Seas, Odessa institute of Biology of the Southern Seas, Odessa (USSR).
G. V. Losovskaya.
Hydrobiological Journal, Vol 14, No 4, p 24-26, 1978. 1 Tab, 7 Ref.

Descriptors: *Bioindicators, *Water pollution, Mussels, Dominant organisms, Biological communities, Benthic fauna, Aquatic populations, Water pollution effects, Oxygen requirements, Biomass, Ecosystems, *Polychaetes, *Black Sea, Hypoxia,

An analysis is given of the species and quantitative development of Polychaeta at the time of succession of a Mytilus galloprovincialis biocoenosis due to hypoxia and suffocation of the benthic fauna. Appreciable changes are noted in these indicators, in particular an increase in the abundance of some europhionic detritophaess among the Polychaets in particular an increase in the abundance of some eurybiontic detritophages among the Polychaeta species after the oxygen deficit and during restora-tion of the biocoenosis. These are regarded as 'progressive in relation to pollution'. Based on the author's own data and published data a list is given of those organisms whose abundant development may be an indication of organic pollution. (Deal-W80-03246

AN ELECTROMYOGRAM OF THE MANDIBULAR ADDUCTOR OF THE INTACT BAIKAL GRAYLING, THYMALLUS ARCTICUS BAICALENSIS, IN A PHENOL SOLUTION, Vsesoyuznyi Nauchno-Issledovatelskii Inst. Tselyulozno-Bumazhnoi Promyshlennosti, Leningrad (USSR). Dept. of Ecological Toxicology. T. A. Karpovich, and B. I. Kolupayev. Journal of Ichthyology, Vol 18, No 5, p 866-869, 1978. 3 Fig. 9 Ref.

1978. 3 Fig. 9 Ref.

Descriptors: *Phenols, *Toxicity, *Respiration, *Fish physiology, Monitoring, Animal metabolism, Mode of action, Chemical properties, Analytical techniques, *Electromyography, *Grayling, *Thy-

The effect of various conditions on mandibular adductor EMG, a measure of respiration, was stud-

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C-Effects Of Pollution

ied. A rapid increase in water temperature (2 degrees in 30 min) resulted in increased motor activity and respiratory frequency. When exposed to phenol, the initial (for 5-10 min) reaction of the grayling was a reduction of motor activity. The duration of the respiratory cycles increased. An increase was subsequently observed in motor activity and respiratory rate. The frequency of coughing movements and the total electrical activity increased considerably. The normal regulation of the mandibular adductor was disrupted. This was expressed in the appearance of non-specific biopoexpressed in the appearance of non-specific biopotentials in the period of bioelectric silence. When exposure to phenol was of short duration these effects were reversible. (Deal-EIS)

THE EFFECT OF CHEMICAL MUTAGENS ON THE SPERMATOZOA OF THE SILVER CARP HYPOPHTHALMICHTHYS MOLITRIX, ANI THE BIGHEAD, ARISTICHTHYS NOBILIS, Kazakh Research Inst. of Fisheries, Alma-Ata (USSR). V. V. Kormilin, R. M. Tsoy, Zh. G. Sarsembayev,

and N. Ch. Artygaliyev. Journal of Ichthyology, Vol 18, No 6, p 1030-1033, 1978. 2 Tab, 5 Ref.

Descriptors: "Toxicity, "Fish reproduction, "Organic compounds, Chemical properties, Mode of action, Fish eggs, Growth stages, Embryonic growth, Stage, Animal pathology, Fertility, "Mutagens, "Teratogens.

In this paper results are presented on the influence In this paper results are presented on the influence of groups of chemical mutagens on the spermatozoa of silver carp and bighead, two commercially important species. The following mutagens were used: nitroso-ethyl urea (NEU); nitrosomethyl urea (NMU); nitrosomethyl-biret (NMB); dimethylsulfate (DMS); and 1,4-bis-dissoacetylbutane (DAB). The approximant of the property of these parameters of these parameters of these parameters of these parameters. The exposure of ripe spermatozoa to these chemical mutagens did not negatively influence the process of fertilization. In fact, NEU, NMB and DMS ess of fertilization. In fact, NEU, NMB and DMS have a stimulating effect on the percentage of egg fertilization in silver carp. However, in the bighead, a sharp increase in the number of aberant embryos was noted. Silver carp spermatozoa proved more resistant to the mutagenic action of these compounds that those of the bighead. (Deal-EIS W80-03249

PHYSIOLOGICAL-BIOCHEMICAL DATA ON EXPERIMENTAL INTOXICATION OF FISH WITH 'YALAN'. Kaspiiskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Astrakhan (USSR).

For primary bibliographic entry see Field 5A. W80-03251

 $\mathsf{I}\mathsf{M}\mathsf{L}$

IMPACT OF THE URBAN EFFLUENT OF CORTIOU ON THE NERITIC PHYTOPLANK-TON POPULATIONS (IN FRENCH), GROUPE EQUIPE POLLUTION PELAGIQUE DE MAR-

EQUIPE POLLUTION PELAGIQUE DE MAR-SEILLE (GROUP EPOPEM).
Centre Universitaire de Luminy, Marseille (France). Lab. d'Hydrobiologie Marine.
In: IVes journees d'études sur les pollutions ma-rines en Mediterranee, Commission Internationale Pour L'Exploration Scientifique De La Mer Medi-terranee, Monaco, 24-27 Novembre 1978, Antalya, Turkey, p 371-375, 1979. 3 Fig. 5 Ref. (English abstract).

Descriptors: *Phytoplankton, *Marine algae, *Water pollution effects, Cyanophyta, Euglonophyta, Sewage effluents, Eutrophication, Plant populations, Marseille, Mediterranean, On site investigations, Diatoms.

Two cruises, in spring, and one, in autumn, have been made in Cortiou area (Marseille's sewage outfall). Close to the outfall (about 2 km) the studied area shows photoautotrophic planktonic populations, mainly Cyanophyceae and Euglonophyceae which were abnormal, but afterwards, very quickly, the population system becomes more normal. The very important result is that, even with these particularly eutrophicating conditions,

no phytopiankton blooms have been observed. But it could be the consequence of inhibiting action of pollutants contained in the sewage water. (Katz-EIS) W80-03255

SUB-LETHAL EFFECTS OF THE ORGANO-PHOSPHATE BLACK FLY LARVICIDE, ABATE (TEMEPHOS) ON SAROTHERODON MOSSAMBICUS (PETERS),

Centre for Overseas Pest Research, London (England).

R. J. Adeney, and P. Matthiessen.

Journal of Fish Biology, Vol 15, p 545-553, 1979. 5 Tab, 21 Ref.

Descriptors: *Pesticide toxicity, *Cichlids, *Larvicides, Insect control, Fish physiology, Mode of action, Organophosphorus pesticides, Animal metabolism, Chemical properties, Electrolytes, Publichealth, Human diseases, Vectors(Biological), *Abate, *Temephos, *Tissiue analysis, *Blood

Sarotherodon mossambicus was exposed for up to 10 weeks to concentrations of Abate larvicide in excess of those produced during blackfly control in African rivers. Despite this treatment, several indicators of sub-lethal poisoning, e.g. growth, plasma glucose, acetylcholinesterase activity remained almost unchanged. A possible explanation for the low toxicity of Abate may be the fact that AChE inhibition is only caused by the oxygen analogues of Abate and not the parent molecule. (Deal-EIS) W80-03261 W80-03261

VENTILATION FREQUENCY COMPENSA-TION RESPONSES OF THREE EURYTHER-MAL ESTUARINE FISH EXPOSED TO MOD-ERATE TEMPERATURE INCREASES, Academy of Natural Sciences of Philadelphia,

Benedict, MD. Benedict Estuarine Research Lab. D. T. Burton.

Journal of Fish Biology, Vol 15, p 589-600, 1979. 6 Fig. 2 Tab, 30 Ref.

Descriptors: *Thermal stress, *Fish behavior, Descriptors: "Thermal stress, "Fish obmaves, *Respiration, Water temperature, Heat resistance, Heated water, Fish physiology, Statistical analysis, Perches, Chesapeake Bay, Seasonal, "Acclimation, *Spot, "Leiostomus, "Hogchoker, "Trinectes, *Spot, *Leiostor *Ventilation rates.

Ventilation frequency patterns of Trinectes macu-latus, Morone americana and Leiostomus xanth-urus were used to evaluate potential thermal stress after exposure to moderate temperature increases. Fish acclimated to 5, 15 and 25C were exposed to a 5C Delta T; fish acclimated to 30C were exposed to a 2.5C Delta T. Ventilation frequencies were to a 2.55 Detail Ventilation frequencies were measured at each acclimation temperature before the fishes were exposed over a 15-min period to the increased temperatures. Ventilation rates were then measured at the elevated temperatures for the next 24h. Significant increases in rate frequency occurred after the temperature increases in T. maoccurred after the temperature increases in Ta maculatus and M. americana acclimated to 5, 15, and 30C. In general, rate frequencies increased as the temperature increased. Ventilation rates stablized quickly at the higher temperatures and remained relatively constant throughout the remaining exposure period. Acclimated rate-temperatures curves (R-T curves), acute R-T curves and Q10 temperature coefficients used to assess the significance of the changes in rate frequency and to compare the species in an ecologically meaningful way, showed that several adaptive types occurred among and between species. This suggests that the temperature increases had a negligible effect, that is, little or no thermal stress occurred. (Deal-EIS) W80-03262

UPTAKE AND CELLULAR DISTRIBUTION OF CADMIUM IN MYTILUS EDULIS,

Kiel Univ. (Germany, F.R.). Zoologisches Inst. For primary bibliographic entry see Field 5B. W80-03263

UPTAKE OF HYDROCARBONS BY THE MARINE DIATOM CYCLOTELLA CRYPTICA, University Coll. of North Wales, Menai Bridge Marine Science Labs. For primary bibliographic entry see Field 5A. W80-03267

HEAVY METALS (HG, CD, CU, PB, ZN) IN LIVER AND MUSCLE TISSUE OF FRESH-WATER PERCH (PERCA FLUVIATILIS) OF THE LAKE OF BIEL AND THE WALENSEE

Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).

For primary bibliographic entry see Field 5A. W80-03269

DIATOMS AND WATER QUALITY IN LOW-LAND STREAMS IN THE PROVINCE OF NORTHERN BRABANT (THE NETHER-LANDS).

Rijksinstituut voor Natuurbeheer, Leesum (Netherlands).

Hydrobiological Bulletin, Vol 13, No 1, p 13-21, 1979. 2 Fig, 2 Tab, 19 Ref.

Descriptors: *Sewage effluents, *Toxicity, *Diatoms, Trophic level, Oligotrophy, Mesotrophy, Dominant organisms, Water chemistry, Hydrogen ion concentration, Agricultural wastes, Streams, *Hollaed*

The diatoms of two Dutch lowland streams were The diatoms of two Dutch lowland streams were studied. The stream Beerze is heavily polluted by the effluent of a sewage treatment plant, causing a change in the pH from less than 4 to more than 6. The acidobiontic diatom Eunotia exigua is replaced by more alkaline and eutraphentic species such as Gomphonema parvulum, Cyclotella menghiniana and Fragilaria capucina. The Simpson diversity index rises to 0.2 in the upper course to 0.9 in the middle course and maintains this level on the lower course. From the stream Rosep samples of 1919-1930 and recent ones were studied. This stream is now polluted by agriculture. In the earliof 1919-1930 and recent ones were studied. This stream is now polluted by agriculture. In the earlier samples oligo-mesotraphentic species dominated (Eunotia spp., Melosira distans). In 1976 the species of organically polluted waters were most abundant. The oligo-mesotraphentic species were hardly recovered. In spite of the severe pollution the number of rare species in both streams is still high, compared with that in stagnant waters. Only in mesotrophic moorland pools and mesotrophic quivering bogs, which are situated in trophic gradients just like both streams, which are situated in ents just like both streams, which are situated in trophic gradients just like both streams, a comparable number of rare species may be found. (Deal-W80-03275

ACCUMULATION OF CADMIUM BY GREEN MICROALGAE, Miyazaki Medical Coll. (Japan). Dept. of Chemis-

For primary bibliographic entry see Field 5B. W80-03276

INFLUENCE OF CRUDE OIL AND DETER-GENTS ON THE CONCENTRATION OF SOME IONS IN HEMOLYMPH OF THE SHRIMP CRANGON CRANGON L. AND THE CRAB RHITHROPANOPEUS HARRISI GOULD, Akademia Medyczna, Gdansk (Poland). Dept. of

Biology. nary bibliographic entry see Field 5B.

PURIFICATION AND PROPERTIES OF SOLU-BLE ARYLSULPHATASES ISOLATED FROM HEPATOPANCREAS OF THE SHRIMP CRAN-GON CRANGON L

Akademia Medyczna, Gdansk (Poland). Dept. of Biology. For primary bibliographic entry see Field 5A.

W80-03278

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

ACTIVITY OF LIVER FRUCTOSE 1,6 BIPHOS-PHATASE IN RAINBOW TROUT HELD IN DIFFERENT CONCENTRATIONS OF INDIS-SOCIATED AMMONIA (IN ITALIAN), Genoa Univ. (Italy). Ist. di Zoologio. For primary bibliographic entry see Field 5B. W80-03279

ORGANOCHLORINES AND METALS IN HAR-BOUR SEALS (DUTCH WADDEN SEA), Netherlands Inst. voor Onderzoek der Zee. For primary bibliographic entry see Field 5B W80-03280

EFFECT OF LONG-TERM LEAD EXPOSURE ON THE SEAWATER AND SEDIMENT BAC-TERIA FROM HETEROGENEOUS CONTINU-

OUS FLOW CULTURES,
Institut fuer Meeresforschung, Bremerhaven (Germany, F.R.). Dept. of Bacteriology.
For primary bibliographic entry see Field 5A.
W80-03283

EFFECTS OF CRUDE OIL ON THE DEVELOP-MENT OF THE SHELL OF MYTILUS EDULIS (L) (MYTILIDAE, BIVALVIA), (IN FRENCH), Laboratoire de Zoologie, Aquaculture and Pollu-tions Marines, Brest (France). For primary bibliographic entry see Field 5B. W80-03284

LEAD TOXICOSIS AND SALT GLANDS IN DOMESTIC DUCKS,
Pisa Univ. (Italy). Cattedra Patologia Generale

For primary bibliographic entry see Field 5B. W80-03287

TOXIC EFFECTS OF THE PHYTOALKALOID COLCHICINE ON OVIPOSITION AND NEUR-OSECRETION OF THE VECTOR SNAIL (IN-DOPLANORBIS EXUSTUS), Marathwada Univ., Aurangabad, (India). Dept. of

Zoology.

For primary bibliographic entry see Field 5A. W80-03289

EFFECTS OF P.P'-DDT, P.P'-DDD, AND P.P'-DDE ON OXYGEN UPTAKE IN THE FRESH-WATER PLANARIAN (PHAGOGATA GRACI-

Middle Tennessee State Univ., Murfreesboro. For primary bibliographic entry see Field 5A. W80-03291

EFFECT OF AMMONIUM CHLORIDE ON PREDATORY CONSUMPTION RATES OF BROOK TROUT (SALVELINUS FONTINALIS) ON JUVENILE CHINOOK SALMON (ONCOR-HYNCHUS TSHAWYTSCHA) IN LABORA-TORY STREAMS.

Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.

J. L. Hedtke, and L. A. Norris.
Bulletin of Environmental Contamination & Toxicology, Vol 24, p 81-89, 1980. 2 Fig, 1 Tab, 12 Ref.

Descriptors: *Ammonia, *Toxicity, *Fish behavior, *Research equipment, Methodology, Analytical techniques, Chlorides, Salmonids, Brook trout, Chinook salmon, Predation, Fish populations.

The present study was undertaken to (1) devise an are present study was undertaken to (1) devise an experimental apparatus to permit study of the impact of ammonia on predator-prey interactions involving salmonid fishes in a flowing water system and (2) quantify the effects of sublethal levels of ammonia in this system. This report describes the apparatus and the influence of ammonia much bloride on consumption of salmon far but tout scribes the apparatus and the influence of ammonium chloride on consumption of salmon fry by trout in laboratory streams. The system was found to be useful in monitoring chloride on consumption of salmon fry by trout in laboratory streams. The system was found to be useful in monitoring the effects of ammonium chloride on the baseline predator-prey interactions. The predator consumption

rates were either depressed or elevated, depending on the concentration of NH3 and the density of the prey. Other types of organism responses like territorial responses, courtship or breeding responses, and food utilization are examples of effects which may be influenced by sublethal exposure to environmental contaminants and which could be tested in this type of system. (Deal-EIS)

SELENIUM TOXICITY TO DAPHNIA MAGNA, HYALLELA AZTECA, AND THE FATHEAD MINNOW IN HARD WATER, SELENIUM Michigan State Univ., East Lansing. Pesticide Re-search Center. For primary bibliographic entry see Field 5A. W80-03294

HYDROIDS IN BIOTEST: CLAVA MULTICOR-NIS EXPOSED TO CADMIUM, Kiel Univ. (Germany, F.R.). Inst fuer Meeres-For primary bibliographic entry see Field 5A. W80-03296

TOXIC EFFECTS AND ACCUMULATION OF CADMIUM IN SOME BENTHIC ORGANISMS OF THE BALTIC, Kiel Univ. (Germany, F.R.). Inst. fuer Meeres-

For primary bibliographic entry see Field 5A. W80-03297

REVIEW OF EXPERIMENTS ON THE CHRONIC TOXICITY EXERTED BY SOME POLLUTANTS ON ANIMAL SPECIES FROM THE BAY OF GDANSK, Akademia Medyczna, Gdansk (Poland). Dept. of Biology.

For primar W80-03298 nary bibliographic entry see Field 5A.

5D. Waste Treatment Processes

SAND FILTRATION OF OXIDATION POND EFFLUENT FOR REUSE IN PARK IRRIGA-

TION,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.

D. Kasper, R. Phillips, R. Sierka, and N. Myers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-140098, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Center, University of Arizona, Tucson, Project Completion Report, January 1980, 64 p. 28 Fig. 7 Tab, 11 Ref. OWRT A-052-ARIZ(1), 14-31-0001-5003.

Descriptors: *Water reuse, *Oxidation pond effluent, *Water pollution treatment, Sand filtration, Irrigation water, Algae filtration, Oxidation pond

This study is an investigation of intermittent sand filtration of oxidation pond effluent utilizing local river bed sands as filter media. The only related river bed sands as filter media. The only related research utilizing oxidation pond effluent was a laboratory and field scale study conducted at Utah State University. The experimental set-up for this investigation consisted of several laboratory scale filter columns filled with local river bed sands. These columns were dosed at a selected rate and sequence with oxidation pond effluent. The parameters investigated included depth, dosting sequence, and hydraulic loading rate. Reproducibility and the effects of column diameter were also investigated to insure the validity of results. The results gated to insure the validity of results. The results of the quality parameters investigated, including COD, volatile and total suspended solids, turbidity and algae concentration, were evaluated statistically. Findings included the following: (I) A slight improvement in filtrate quality occurred in the ly. Findings included the following: (1) A singht improvement in filtrate quality occurred in the smaller diameter columns. (2) Filtrate quality improved significantly with increasing filter depth. (3) Only slight differences in filtrate quality were found for filters operated on three and four day dosing cycles. (4) Filtrate quality deteriorated with

increased hydraulic loading rates. (5) Continuous operation of filters resulted in clogging. W30-03004

ALTERNATIVES FOR WASTEWATER TREAT-MENT IN RURAL AREAS, Maine Univ. at Orono. Dept. of Civil Engineering.

Maine Univ. at Orono. Dept. of Civil Engineering. F. E. Woodard.
In: Water Problems in the Rural Environment.
Alternative Solutions for Water Supply and Wastewater Disposal. Proceedings of a Conference Held at Lincoln, Nebraska on November 4-5, 1976. p 73-87. 7 Fig. 8 Ref.

Descriptors: *Rural areas, *Alternative planning, *Disposal, *Waste water treatment, Water quality, Groundwater, Discharge(Water), Costs, Waste Aboutstien *Rural areas, *Alternative planning, Strong disposal, Surface waters, Absorption, Sewage lagoons, Sewage treatment, Sewage, Water pollution treatment, Activated sludge, Septic tanks.

Design of wastewater treatment processes should be compatible with the final disposal site, assuming either groundwater or a surface water body. Treatment before discharge to surface waters requires complete removal of solids, biodegradable organic material (BOD) and infectious agents (disinfection). Any additional material which pollutes the water, such as color, heavy metals, or other toxic material, must also be removed. This can be accomplished by using a package plant, septic tank and sand filter system, or lagoon or stabilization basin followed by sand filters. Package plants are small activated sludge type treatment systems. Lagoons and stabilization basins are ponds in which wastewater is held for a few days to several months. Suspended solids and oxidizable materials are removed by bioflocculation, sedimentation, oxidation, and reduction. With groundwater disposal, the ground itself is the primary treatment medium. A septic tank pretreats wastewater before it is applied to the ground in order to prolong the life of the disposal site. The basic ground application system is the absorption trench. Bed and chamber systems overcome problems with low soil permeability. The mound system overcomes problems of shallow depth to an impermeable stratum and high groundwater tables. Costs vary greatly with size ability. Ine mound system overcomes problems of shallow depth to an impermeable stratum and high groundwater tables. Costs vary greatly with size and construction type. Generally, the least expen-sive system in favorable soil is a septic tank-absorp-tion trench. (See also W78-11244) (Danovich-Wisconsin) W80-03131

DESIGN OF A SUBSURFACE WASTE DISPOS-AL SYSTEM WITH BIOLOGICAL DENITRIFI-

Connecticut Univ., Storrs. Inst. of Water Resources. R. Laak.

R. Laak.
Available from the National Technical Information
Service, Springfield, VA 22161 as PB80-140056,
Price codes: A02 in paper copy, A01 in microfiche.
Research Project Technical Completion Report,
1979. 20 p, 6 Tab, 2 Fig, 27 Ref. OWRT A-062CONN(1), 14-34-0001-9007.

Descriptors: *Denitrification, *Waste water treatment, *Design, Waste disposal system, Methodology, Greywater, Carbon source, *Septic tank efflu-

a nitrification-denitrification system, using greywater as the organic carbon source in the denitrification step. A preliment source in the Nitrogen was removed from septic tank effluent in greywater as the organic carbon source in the dentrification step. A preliminary study showed greywater from a typical home contained abundant soluble carbon that biodegraded at the same rate as methanol, which, until this study, appeared to be the most promising source of organic carbon for such a system. A second laboratory study used aerobic sand column reactors to nitrify unfiltered septic tank effluent, and fixed media columns consisting of stones dimensionally similar to those used in conventional trickling filters to denitrify the waste. Greywater, settled sewage, and methanol were added prior to the denitrification step to determine their auitability as possible sources of organic carbon. Greywater removed 71% of the available nitrate, methanol removed 83%, and set-

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D-Waste Treatment Processes

tled sewage removed 4.3%. A field demonstration model was then built, using an aerobic subsurface sand filter bed for blackwater nitrification and an anoxic denitrification reactor based on a five day liquid detention time. Some of the greywater from inquit detention time: some of the greywater from the household acted as the carbon source for deni-trification, removing up to 99% of the available nitrate. It was concluded that greywater is an acceptable carbon source for denitrification. W80-03174

APPARATUS FOR TREATING METAL CONTAINING WASTE WATERS,
Gotzelmann KG Industrieabwasser-Anlagen,
Stuttgart (Germany, F.R.). (Assignee).
R. Kammel, and H.-W. Lieber.
U.S. Patent No 4,172,780, 10 p, 6 Fig, 6 Ref.
Official Gazette of the United States Patent Office,
Vol 987, No 5, p 1209, October 30, 1979.

Descriptors: *Patents, *Waste water treatment, *Waster pollution treatment, *Industrial wastes, *Separation techniques, *Metals, Electrolysis, Cathodes, Anodes, Vibrations, Equipment, Product recovery

A method for treating metal containing waste water employes a vessel containing the waste water in which there is provided at least one anode and a cathode comprised of electrically conductive elements. The waste water is subjected to electrolysis during which the cathode elements are moved. The cathode elements are provided in the form of rods which are arranged in the vessel by means of at least two holding devices so that the rods extend parallel to one another and can be moved in the holding devices relative to one another. The holding devices are moved during electrolysis so that the rods strike one another again and again at spaced intervals. Since the rods of the cathode strike one another again and again, the deposited layers of metal are continuously separated from the rods so that continuous operation is assured. The relatively few heavy metal rods can be guided in space with great accuracy. It is thus possible to make electrical contacts by means of current leads having a small contacting surface and high areal compressions which results in very low transfer resistance and thus a low voltage requiretransfer resistance and thus a lot votage ment. Furthermore the anodes can be brought very close to the cathode. This results in low energy requirements and consequently relatively little requirements and consequently relati heating of the electrolyte. (Sinha-OEIS) W80-03265

WASTE WATER PROCESS FOR TREATMENT OF STRONG WASTES, Standard Oil Co. (Indiana), Chicago, IL. (Assign-

ee).
J. D. Walk, J. F. Grutsch, and R. C. Mallatt.
U.S. Patent No 4,172,781, 10 p, 1 Fig; 15 Ref;
Official Gazette of the United States Patent Office,
Vol 987, No 5, p 1209, October 30, 1979.

Descriptors: *Patents, *Waste water treatment, *Waster pollution treatment, *Industrial wastes, Separation techniques, Aeration, Activated sludge, Activated carbon, Oxygenation, Powdered carbon.

A waste water process for the treatment of strong A waste water process for the treatment of strong wastes is disclosed. Generally the process comprises an activated sludge process for the purfication of waste water comprising: feeding the waste water to a first aeration zone where oxygen is introduced, and the waste water is contracted with activated sludge; passing the effluent from the first aeration zone to a first clarification zone to separation zone to a first clarification zone to separation. aeration zone to a first charification zone to sepa-rate suspended sludge particles from partially de-contaminated water; recycling a portion of the separated sludge and passing the partially decon-taminated water from the first clarification zone to a second seration zone; adding about 5 to about 500 ppm powered activated carbon to the partially decontaminated water; oxygenating the water con-taining carbon; passing the effluent from the second aeration zone to a second clarification zone to separate suspended sludge and carbon particles; and recycling a portion of the separated sludge and carbon and passing the decontaminated water out. (Sinha-OEIS) W80-03266

UMI

PROCESS FOR THE SEPARATION OF CAD-MIUM (CD++) IONS FROM SEWAGE WASTE WATER AND AQUEOUS SOLUTIONS WASTE WAILER AND AUGEOUS SOLUTIONS, Deutsche Gold- und Silber-Scheideanstalt A.G., Frankfurt am Main (Germany, F.R.).
H. Knorre, G. Pohl, and K. Stutzel.
U.S. Patent No 4,172,784, 4 p. 6 Ref; Official Gazette of the United States Patent Office, Vol 987, No 5, p 1210, October 30, 1979.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Industrial wastes, Cadmium, Separation techniques, Chemical precipitation.

Cadmium (Cd++) ions are separated from an effluent containing complexing agent such as nitrilotriacetic acid, ethylenediamine tetraacetic acid and/or diethylenetriamine pentaacetic acid, or their anionic salts by using an HS-containing triazine compound and Fe+++ ions in a quantity at least equal to the amount of complexing agent. (Sinha-DEIS) WRO 03270

OUTLET FOR SEPTIC TANKS.

U.S. Patent No 4,172,799, 7 p, 6 Fig, 6 Ref; Official Gazette of the United States Patent Office, Vol 987, No 5, p 1215-1216, October 30, 1979.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Septic tanks, Pollution abatement, Soil disposal fields, Equipment.

A septic tank has an improved outlet which may A septic tank nas an improved outlet which may be readily installed in existing septic tanks without modification of the tank or outlet fittings, to prevent the discharge of particles of sewage suspended in the effluent from passing directly into the drain field. The outlet includes a 'T', a dual conic deflector composed of two cones jointed at their bases and flexibly supported directly below the open lower end of the 'T'. Effluent containing solid particles rising from the bottom of the tank during the fermentation process is deflected. The during the fermentation process is deflected. The flexible mounting permits sidewise displacement of the conic deflector so that the upright portion of the come detector so that the upright portion of the 'T' can be reamed to remove any accumulation of deposits. The conic deflector is weighted so as to return to its original position after the reaming operation has been completed. (Sinha-OEIS) W80-03273

METHOD FOR THE SEPARATION FROM EACH OTHER OF THE COMPONENTS OF A MIXTURE OF WATER, OIL AND DIRT (SLUDGE) AS WELL AS APPARATUS FOR PERFORMING SAID METHOD, H. J. Ankersmit.

U.S. Patent No 4,176,068, 7 p, 2 Fig, 4 Ref; Official Gazette of the United States Patent Office, Vol 988, No 4, p 1052-1053, November 27, 1979.

Descriptors: *Patents, *Waste water treatment, *Waster pollution treatment, *Separation techniques, Oil pollution, Oily water, Sludge, Flow separation, Equipment, Ballast water.

A method and apparatus is described for separating into components a mixture of water, oil and sludge. The mixture is poured out of a downwardly-directed conduit onto the upper surface of a conically-shaped chamber having a discharge flow capacity at its lower end corresponding to the sludge volume content of the mixture. The oil and water are drawn off and conducted to a chamber formed at the lower surface of the conically-shaped chamber upon which the mixture was initially discharged. One or more filters are provided at the bottom portions of the second chamber to separate the oil and water. By continuously discharging heavy components from the narrow portion of the chamber, separation takes place between heavy components and lighter components. The lightest component (the oil) will rise as far as possible and component (the oil) will rise as far as possible and form a layer which is continuously discharged, while a quantity of mixture formed by light components (water, oil and light sludge) will collect between the upper side of the chamber and it is continuously discharged to undergo a further separating treatment. (Sinha-OEIS)

W80-03274

GRAVITATIONAL FLOW SEPARATOR OF THE MULTIPLE, APERTURED TUBE TYPE FOR SEPARATING WATER FROM SAND,

A. H. Sloan. M. H. Stoath. U.S. Patent No 4,176,066, 7 p. 10 Fig. 3 Ref; Official Gazette of the United States Patent Office, Vol 988, No 4, p 1052, November 27, 1979.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, Separation techniques, Sands, Coarse sediments, Storm drains, Flow separation, Equipment, Construction equipment.

A dewatering separator device for separating solid particles such as sand, gravel, or the like from water, preconditions the water either for further filtering elsewhere or for permitting the water to be accepted in storm drains. The separator device is of the gravitational flow type and includes vertically arranged tubes, each of which has small apertures in the form of thin slits in their side walls. The mixture of solid material, i.e., sand, gravel, etc. and water is dumped through the top of the tubes, causing the heavier solid material to pass through the tubes where it is collected in a constituent trap, and from which the material is periodically disthe tubes where it is collected in a constituent trap, and from which the material is periodically discharged at one location. The water passes through the small slits in the sidewalls of the tubes and is discharged. The device has a movable support to render it portable for transport to different job sites. (Sinha-OEIS)

W80-03281

5E. Ultimate Disposal Of Wastes

MEASURING THE RISKS OF WASTE DISPOS-AL BY DEEP-WELL INJECTION, Marquette Univ., Milwaukee, WI. For primary bibliographic entry see Field 6B. W80-03005

A STUDY OF THE EFFICIENCY OF SEPTIC TANK EFFLUENT TREATMENT IN TWO RAISED BED SYSTEMS, Maine Univ. at Orono. Dept. of Civil Engineering.

G. S. Nault

G. S. Nault. Available from the National Technical Information Service, Springfield, VA 22161 as PB80-140189, Price codes: A09 in paper copy, A01 in microfiche. MS thesis August 1979, 187 p, 85 Fig, 38 Tab, 22 Ref, 1 Append, OWRT A-040-ME(2).

Descriptors: *Sewage treatment, *Septic tanks, *Waste water disposal, Environmental sanitation, Soil moisture, Soil physical properties, Sands, Clays, Chemical oxygen demand, Biochemical oxygen demand, Ammonia, Coliforms, Nitrogen, Water table, Maine, Raised beds, Mound systems.

Two raised bed systems for distribution of septic tank effluent located in Orono, Maine, on soils not suitable for conventional septic tank soil absorption suitable for conventional septic tank soil absorption systems were studied to determine treatment performance under given trench and site conditions. The two 'mound' systems were installed at private homes and chemical, physical, and biological parameters were monitored during 1978 and 1979. The first system, built according to the Maine State Plumbing Code, was a large 125 ft by 44 ft mound with the bottom of the absorption trench located 4 ft below the top of the mound. The 75 ft trench was 1 ft deep and 5 ft wide running east to west. The second system used less sand and had a pumping system for effluent distribution. It was 45 ft by 100 ft with 6 absorption trenches 3 ft wide by 1 ft deep and 29 ft long with an overall mound height of 3 ft. Sand fill for both mounds came from the same pit. Marine clay barriers were used to seal height of 3 ft. Sand fill for both mounds came from the same pit. Marine clay barriers were used to seal the mounds. Parameters monitored include; soil moisture, chemical oxygen demand, biochemical oxygen demand, ammonia nitrogen, organic nitro-gen, nitrate nitrogen, chloride, coliforms, water level, and flow. Results show that groundwater table location in relation to the sand fill is a domi-nant footor in treatment efficiency. Sand fill was nant factor in treatment efficiency. Sand fill treat-ment efficiency decreased as saturation conditions

increased. Marine clay was found to be an effective treatment medium given effective pretreatment and distribution of septic tank effluent. Neither system showed signs of freezing in winter although lower temperatures did decrease sand fill treatment efficiency. (Seigler-IPA) W80-03085

ENVIRONMENTAL INFLUENCES ON THE DEVELOPMENT OF OIL-DECOMPOSING MICROORGANISMS,

Northern Research Inst. of Hydraulic Engineering and Land Reclamation, Kazan Reclamation, Kazan (USSR). Dept. of Hydrology and Water Re-

sources. N. V. Morozov, and V. N. Nikolayev. Hydrobiological Journal, Vol 14, No 4, p 47-53, 1978. 3 Fig, 1 Tab, 16 Ref.

Descriptors: *Microbial degradation, *Oil, *Water temperature, Hydrogen ion concentration, Oxida-tion, Bacteria, Nitrogen, Phosphorus, Metabolism, Pseudomonas, Respiration, Growth rates, Oxygen

Oil-decomposing microorganisms are shown to be highly biologically active in the purification of water from oil in the range pH 5-9. Temperatures of 20-28C are conducive to their development, but of 2D-28C are conducive to their development, but they also grow intensively and maintain a high rate of oxidation of oil at low temperature (6-8C). Readily oxidizable organic matter and biogenous elements in the form of ammonium salts of nitro-gen and phosphorus must be added to the medium to maintain the physiological activity of the micro-organisms. (Deal-EIS)

5F. Water Treatment and **Quality Alteration**

POLYMERS FOR PREVENTING AND RE-MOVING SCALE IN BOILERS, Nalco Chemical Co., Oak Brook, IL. (Assignee). K. G. Phillips, and J. F. Kneller. U.S. Patent No 4,171,988, 4 p, 1 Tab, 1 Ref; Official Gazette of the United States Patent Office, Vol 987, No 4, p 937, October 23, 1979.

Descriptors: *Patents, *Water treatment, *Industrial water, Demineralization, Scaling, Hardness(Water), Boiler feed water, Heated water, Chemical reactions, Descaling, Polymers.

Water-soluble ampholytic polymers formed by reacting chloroacetic acid with a cationic polymer formed by reacting epichlorohydrin and ammonia are effective in removing and inhibiting calcium formation in boilers under conditions in which steam is generated under pressures ringing from 15 p.s.i. up to about 1500 p.s.i. The ampholytic polymers may be added either to the boiler feedwater or directly to the water in the boiler feedwater. mers may be added either to the boiler feedwater or directly to the water in the boiler where the steam is generated. To accomplish close additive control, the polymers are added in aqueous solution form wherein the active ingredient comprises from about 10% up to the maximum of solubility of the polymer in water. An alkaliane material may be required to adjust the boiler water to within the desired pH range. (Sinha-OEIS)

POLYPHOSPHATE-BASED INDUSTRIAL COOLING WATER TREATMENT, Nalco Chemical Co., Oak Brook, IL. (Assignee).

National College Colle

Descriptors: *Patents, *Water treatment, *Cooling water, *Industrial water, Scaling, Corrosion, Chemical reactions, Polyphosphates.

When a specific condensed phosphate glass is com-bined with an organic phosphate ester, an im-proved composition is afforded for preventing scale and corrosion in industrial cooling systems. Optionally, certain azoles are combined with the

phosphate glass and phosphate ester to afford protection to non-ferrous metals. (Sinha-OEIS) W80-03139

OZONATION OF COOLING WATERS, TOWER

M. F. Humphrey, K. R. French, and R. D. Howe. U.S. Patent No 4,172,786, 5 p., 1 Fig, 1 Tab, 3 Ref. Official Gazette of the United States Patent Office, Vol 987, No 5, p 1211, October 30, 1979.

Descriptors: *Patents, *Water treatment, *Water quality control, Industrial water, Cooling water, Scaling, Corrosion, Ozone.

Continuous ozone injection into water circulating between a cooling tower and heat exchanger with heavy scale deposits inhibits formation of further deposits, promotes flaking of existing deposits, in-hibits chemical corrosion and controls algae and bacteria. (Sinha-OEIS) W80-03271

WATER PURIFIER APPARATUS, Teledyne Industries, Inc., Ft. Collins, CO. (Assign-For primary bibliographic entry see Field 5G. W80-03272

5G. Water Quality Control

METHOD FOR PREVENTING THE CONTAMINATION OF SUBSOIL WATER FROM PRODUCTS DEPOSITED ON THE GROUND OR IN UNDERGROUND CAVITIES, C. O. Morfeldt.

US Patent No 4,171,921, 6 p, 3 Fig, 7 Ref; Official Gazette of the United States Patent Office, Vol 987, No 4, p 914, October 23, 1979.

Descriptors: *Patents, *Subsurface water, *Water quality control, Water pollution control, Pollution abatement, Underground structures, Tunnels, Sinks, Water levels, Flow, Velocity.

A method for preventing the contamination of subsoil water by harmful substances which origi-nate from an object at or near ground level is described. A tunnel having a water permeable wall is formed below the natural water level to thus form a sink funnel in the subsoil. The accumulated torm a sink funnel in the suspoil. The accumulated water in the tunnel is drained away quickly enough so that the velocity of water movement toward the tunnel exceeds the water velocity in all other directions. (Sinha - OEIS) W80-03025

OUTDOOR ALGAL MASS CULTURES--I. AP-PLICATIONS.

Woods Hole Oceanographic Institution, MA J. C. Goldman

Water Research, Vol 13, No 1, p 1-19, 1979. 10 Fig, 1 Tab, 111 Ref. U.S. Dept. of Energy EG-77-S-02-4151.

Descriptors: *Algae, *Photosynthesis, *Cultures, *Technology, Waste water treatment, Production, Universities, Energy, Solar energy, Mass, Re-search priorities, Resource development, Applica-tion methods, Engineering, Research and develop-ment, Proteins, Foods, Food processing industry, Chemicals, Nutrients, Recycling.

Traditional and new applications for outdoor algal mass cultures are discussed. Early efforts were directed towards single-celled protein production circcted towards single-celled protein production for human consumption; however, many new applications have evolved including wastewater treatment, water renovation, nutrient recycling, chemical production, aquaculture, and bioconversion of solar energy. Mass algal culturing problems relate to culture mixing, nutrient availability and addition, species control, CO2 addition, water supply and eyaporation and algal expansion and addition, species control, CO2 addition, water supply and evaporation and algal separation and harvesting. Algal yields up to 30-40 g dwt/sq m d have been reached for short time periods and yields between 15-25 g dwt/sq m d for longer periods are now common. Algal mass culturing on

a large-scale is not a feasible solution for protein

Water Quality Control-Group 5G

a large-scale is not a feasible solution for protein production or solar energy conversion, however, the process has high potential in wastewater treatment, aquaculture, and as a source of certain chemicals such as glycerol. Recent works of Oswald at Berkeley, Ryther at Woods Hole, and Shelef in Israel, show that algal systems have great versatility for solving environmental problems, particulary when designed as integrated-multi-use systems for wastewater treatment, water renovation, nutrient recycling and animal protein feeding. (Danovich-Wisconsin) W80-03105

FLOATING OIL SKIMMER.

U.S. Patent No 4,172,036, 6 p, 5 Fig, 9 Ref; Official Gazette of the United States Patent Office, Vol 987, No 4, p 953, October 23, 1979.

Descriptors: *Patents, *Oil pollution, *Water quality control, *Separation techniques, Skimming, Floating, Equipment, Oil recovery.

An apparatus for removing oil floating on water comprises buoyant means for floating the appara-tus and at least one set of rotatable discs having spaced apart, generally parallel, vertically oriented discs. Each disc has an outer edge and generally collinear centers. The sets of disc are mounted on the buoyant means so that the discs are partly submerged. A drive means rotates the discs so that oil floating on the water adheres to the discs and is moved away from the water surface as the discs noveu away from the water surface as the discs rotate. The oil adhering to the discs is removed and directed to a storage location. Preferably, the apparatus has three sides and three corners, one set of discs being mounted along each side in a trian-gular arrangement. (Sinha-OEIS) W80-03143

GROUND-WATER SALINITY PROBLEMS RE-LATED TO IRRIGATION IN THE COLORADO RIVER BASIN.

Tennessee Valley Authority, Norris, TN. Office of Natural Resource

M. T. El-Ashry. Ground Water, Vol 18, No 1, p 37-45, January-February 1980. 8 Fig, 4 Tab, 23 Ref.

Descriptors: *Salinity, *Groundwater, *Irrigation, *Colorado River Basin, Saline water, Salts, Water quality, Water quality control, Leaching, Aquifers, Irrigation water, Irrigation practices, Irrigation operation and maintenance, Irrigation effects, Agri-

culture.

The groundwater system in many of the irrigated areas of the Colorado River Basin is derived almost entirely from deep percolation of irrigation water and seepage from irrigation conveyance and ailwater collection systems. Salt pickup rates from irrigated soils in the basin vary in the different areas. Among the high salt pickup areas is the Grand Valley in western Colorado, estimated at 8 tons/acre/year. Water entering the groundwater supply from irrigation practices in the valley amounts to about 145,000 acre-feet/year and contributes about 690,000 tons/year to the salt load of the Colorado River. Samples of base-flow water from the weathered Mancos Shale aquifer in the valley vary in salinity from about 1,500 to about 9,000 mg/l with a mean of 4,100 mg/l; while water samples from alluvial aquifers range from 305 to 124,000 mg/l with a mean of about 11,500 mg/l. Base-flow returning to the river in the drains and washes has concentrations that average about 4,200 mg/l. Water losses and quantities of irrigation return flows can be reduced by improving farm irrigation efficiency is and by partial or complete lining of canals, laterals, and ditches. Increasing on-farm irrigation efficiency through system improvements and irrigation scheduling is the most cost-effective measure. However, achievement of higher efficiencies will require changes in water laws to encourage conservation and revised water pricing policies that discourage waste. (Simslaws to encourage conservation and revised water pricing policies that discourage waste. (Sims-ISWS) W80-03189

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

OF COOLING TOWER **OZONATION** For primary bibliographic entry see Field 5F. W80-03271

WATER PURIFIER APPARATUS, Teledyne Industries, Inc., Ft. Collins, CO. (Assign-

T. E. Corder.
U.S. Patent No 4,172,796, 10 p. 13 Fig. 11 Ref;
Official Gazette of the United States Patent Office,
Vol 987, No 5, p 1214-1215, October 30, 1979.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, Filtration, Domestic water, Filters, Valves, Taste, Odor, Filter

A water purification device includes a housing having a base portion and a generally-cylindrical cup-shaped cap removable secured to it. An input fluid channel in the base portion communicates with one end of the chamber defined by the cup and an outlet fluid channel communicates with that and an outlet fluid channel communicates with that chamber end. A filter cartridge placed within the cap has a conduit that extends between its opposite end walls. Filter material surrounds the conduit. An inlet opening in the cartridge is positioned to communicate with the input fluid channel so as to permit water to flow through the filter material. An outlet opening in the cartridge is arranged to communicate from the filter material to the other end. A valve is included in an extension of the base portion in order to selectively control the distribution of water. The valve itself has a bore and a tion of water. The valve itself has a bore and a corresponding stem which are longitudinally tapered. (Sinha-OEIS) W80-03272

6. WATER RESOURCES **PLANNING**

6A. Techniques Of Planning

TOWARDS A DEFINITION OF DROUGHT Ministry of Overseas Development, London (England). S. Sandford

S. Sandiorot.

In: Proceedings Symposium on Drought in Botswana, June 5-8, 1978, Gaborone. Published by the Botswana Society in collaboration with Clark University Press. p 33-40, 1979. 2 Fig. 1 Tab, 7

Descriptors: *Droughts, *Water shortage, *Analytical techniques, *Botswana, Regional analysis, Planning, Probability.

Although people tend to define drought in ways that best suit their needs, there are occasions such as insurance, government legislation, regulations, planning, prediction, etc., when a precise definition is required. A logical concept of drought as a rainfall-induced shortage between the supply of a good and the requirements for that good, is developed here that incorporates several additional useful elements and one which can be extended to yield useful practical results for policy makers in terms of rough quantitative estimages of the effects of different degrees of severity. Such a quantitative application of the concept is illustrated here for livestock feed in Botswana in which the probabilities of drought of given degrees of severity occurring in different regions are calculated. (Tickes-Attizona) Arizona) W80-03060

BOTSWANA'S PRESENT CLIMATE AND THE EVIDENCE FOR PAST CHANGE, University Coll. of Botswana, Gaborone. Dept. of Geography.

H. J. Cooke

UMI

In: Proceedings Symposium on Drought in Bo-tswana, June 5-8, 1978, Gaborone. Published by the Botswana Society in collaboration with Clark University Press. p 53-58, 1979, 15 Ref.

Descriptors: *Weather forecasting, *Paleoclimatology, *Environmental effects, *Botswana, *Deci-

sion making, Variability, Rainfall, Agroclimatology, Africa.

Botswana's climate, determined principally by its position in the center of southern Africa and its latitudinal position, is unreliable and therefore marginal. This review of this largely arid country's present climate and the evidence for past climate change indicates that (1) in southern Africa, in-hotble Bottones there is strong existerical likelichange indicates that (1) in southern Africa, in-cluding Botswana, there is strong statistical likeli-hood of below-average rainfall in the next decade, (2) the earth appears to be entering a period of greater climatic variability, and (3) pressure on Botswana's already fragile ecosystem is heavier than ever before. On this basis it is concluded that if the effects of fluctuations in atmospheric circula-tion are not generally understood, agricultural pro-ductivity will become less stable, centralized sys-tems will become more vulnerable, and there will be greater need to insulate communities. Informabe greater need to insulate communities. Informa-tion regarding the impact of climatic variability on human activities is essential to government deci-sions. (Tickes-Arizona) W80-03062

AUSTRALIAN DROUGHT WATCH SYSTEM, Bureau of Meteorology, Melbourne (Australia). D. M. Lee.

D. M. Lee. In: Proceedings Symposium on Drought in Bo-tswana, June 5-8, 1978, Gaborone. Published by the Botswana Society in collabration with Clark University Press. p 173-208, 1979. 21 Fig. 9 Tab, 1

Descriptors: *Forecasting, *Droughts, *Meteorological data, *Monitoring, Australia, Computer programs, Rainfall, Data transmission.

Operation of a computerized drought alert system introduced by the Bureau of Meteorology in Australia in 1974 to remove subjectivity from the selection of analysis areas, and to speed up the publication of the Drought Review, is described here in detail. The System, based on the monthly rainfall totals of some 800 selected stations telerainfall totals of some 800 selected stations tele-graphically reporting throughout Australia over a period of at least 40 years is compared to the previous manual method for the 1972 Australian drought, with an example of its application to Mahalapye in Botswana. It is concluded that this newer computerized system enables a better delin-eation of areas of rainfall deficiencies than was apreviously available under a subjective system. By performing many of the calculations prior to the end of the month, it is now possible to make probability statements about the state of rainfall deficiencies that will exist some three weeks into the future, and it is hoped that the system, when the future, and it is hoped that the system, when applied worldwide, would establish an alerting and advisory approach on a routine objective basis for areas where there is concern for rainfall deficiencies. (Tickes-Arizona) W80-03072

AN ASPECT OF WARNING SYSTEMS FOR DROUGHT: INFORMATION COLLECTING IN THE DISTRICTS.

Botswana Ministry of Local Government and Lands, Gaborone. E. Wily.

In: Proceedings Symposium on Drought in Bo-tswana, June 5-8, 1978, Gaborone, Published by the Botswana Society in collaboration with Clark University Press. p 211-218, 1979. 3 Ref.

Descriptors: *Droughts, *Forecasting, *Botswana, *Comprehensive planning, Project post-evaluation, Monitoring, Local governments.

Over the last 12 months, the Ministry of Local Government and Lands of Botswana has actively pursued a strategy of decentralized planning, en-abling districts to formulate their own immediate as well as five-year plans for incorporation in the overall Fifth National Development Plan (1979-1985). The Drought Committee has further recommended that districts individually deviee procedures for monitoring drought conditions or indications, and associated procedures for implementing drought relief for which they will be responsible. It is the purpose of this paper to elucidate the

guidelines or framework by which the individual districts are to carry out this task and to document how far this particular element of drought planning has progressed over the past twelve months Water-related elements include rainfall, livestock water-related elements include raintail, investock water supplies, and grazing conditions. Not all districts have yet complied with the Ministry's request for the establishment of a drought warning system, but procedures presented by five districts in compliance are reviewed here. (Tickes-Arizona) W80-03073

DROUGHT AND ARABLE FARMING, Botswana Ministry of Agriculture, Gaborone. D. B. Jones.

D. B. Jones. In: Proceedings Symposium on Drought in Bo-tswana, June 5-8, 1978, Gaborone. Published by the Botswana Society in collaboration with Clark University Press. p 234-239, 1979. 2 Fig, 9 Ref.

Descriptors: *Droughts, *Livestock, *Future planning(Projected), *Arable land, Farm management, Administration, Botswana, Seeds.

Although drought in Botswana is often thought of in terms of its effects on livestock and ranges, more general considerations indicate that arable and livestock droughts frequently exhibit both temporal and economic differences. While pointing out that and economic currences. while pointing out that this comparison of the pure pastoralist with the pure arable farmer is somewhat academic, since most Botswana farming households are involved in mixed farming, it is emphasized here that there are strong ties between the two enterprises and that a failure in one will often cause a serious problem in the other. A conjectural look at the recovery of the property of the property of the convergence of the property of the property of the convergence of the pure property of the property of the pure pure property of the pure pure property of the pure arable agriculture indicates that the government needs to be far more concerned with the problem of multi-year drought than single season drought, regardless of whether these are arable only or regardless of whether these are arable only or arable-plus-livestock droughts. Some suggestions of possible measures to assist post-drought recov-ery are offered and discussed in terms of policy implications, including seed storage for use in times of drought-induced shortages, and contract ploughing. The author presents these as prelimi-nary ideas only, and urges greater official consider-ation of not only these but other options as well. (Tickes-Arizona) (Tickes-Arizona) W80-03074

THE TRIBAL GRAZING LAND POLICY'S RELEVANCE IN A DROUGHT-PRONE ENVI-

RELEVANCE IN A DROUGHI-FRONE ENVI-RONMENT, International Livestock Centre for Africa, Addis Ababa (Ethiopia). R. R. Von Kaufmann.

In: Proceedings Symposium on Drought in Bo-tswana, June 5-8, 1978, Gaborone. Published by the Botswana Society in collaboration with the Clark University Press. p 255-260, 1979. 2 Fig, 9

Descriptors: *Droughts, *Grazing, *Pasture management, *Botswana, *Water allocation(Policy), Equitable apportionment, Comprehensive plan-

Botswana's Tribal Grazing Land Policy (TGLP), an open and comprehensive land reform program, is analyzed here in terms of its relevance in a drought-prone environment where the unregulated development of water sources by individuals who tend to dominate the use of surrounding tribal lands has been curtailed. Recognizing that the present common ownership of land forces individuals to marinize their private wealth in livestock. present common ownership or land forces individuals to maximize their private wealth in livestock at the expense of the commonwealth of rangeland, the hypothesis of the TGLP is that creation of smaller, more manageable land units with which individuals can identify, is the best most equitable way of generating a proprietary interest in long-term husbandry of range resources. While no con-clusions about the relevance of this policy can be drawn yet, it is assumed that if this reform continuses to move in the direction of providing manageable farming units with control over defined land areas accompanied by a move towards more sophisticated technology, it will be highly relevant to drought recovery. (Tickes-Arizona)

Evaluation Process—Group 6B

A PROCESS FOR COMMUNITY FLOOD PLAIN MANAGEMENT.

PLAIN MANAGEMENT.
Leman Powell Associates, Inc. Alexandria, VA.
Available from the National Technical Information
Service, Springfield, VA 22161 as PB80-135296,
Price codes: A06 in paper copy, A01 in microfiche.
Office of Water Research and Technology Planning Manual OWRT TT/79 9, November 1979,
121 p, 8 Fig. 7 Tab, 27 Ref, 5 Append. OWRT T0008(6707)(1), 14-34-0001-6707.

Descriptors: *Flood plains, *Flood control, *Planning, *Management, Flood damage, Design flood, Flood protection, Flooding, Flood plain zoning, Floodways, River flow, Flood stages, Legal aspects, Flood plain insurance, Risks.

Guidelines for the process of preparation and management of plans for the reduction and avoidance of flood damage in flood plain areas are presented. Flood plain management is the combination of appropriate measures to deal with a flooding problem in a particular area. These measures may be structural (dams, levees, floodwalls, diversions, iem in a particular area. These measures may be structural (dams, levees, floodwalls, diversions, and channel improvements) or nonstructural (land use regulations and zoning). An initial planning step is the evaluation of the flood plain to identify and delineate the area. Three types of land subject to flooding are riverine flood plains, coastal flood plains, and especial flood plain areas such as shallow flooding areas, wetlands, and sinkholes. Aspects to be included in an evaluation include economic, social, political and organizational, and environmental. Suggested evaluation processes are summarized. The general planning process is described along with a review of the variety of means and tools available for flood plain management implementation. Other management planning information provided includes legal framework, and technical and financial assistance available. Finally the process for bringing together all the aspects of planning is described and an example is given. (Seigler-IPA)

MANAGEMENT OF WATER RESOURCES -CO-OPERATIVE GAME-THEORETIC A PROACH TO INTER-STATE PROBLEMS,

P. K. Rao. ASCI Journal of Management, Vol 8, No 1, p 1-13, September 1978. 1 Tab.

Descriptors: *Simulation analysis, *India, *Water allocation(Policy), *Federal-state water rights conallocation(Folicy), "Federal-state water rights con-flicts, "Administrative agencies, Systems analysis, Equitable apportionment, Cost-benefit analysis, Economics, Cost sharing, Political constraints, In-stitutional constraints, Japan, Water resources de-velopment, Regulation, Federal government, U.S. Water Resources Council, State governments, Water rights.

An analytical methodology based on cooperative game theory, previously reported from a water resources system case study in Japan, is tested for equitable of costs and benefits of interstate water equitable of costs and benefits of interstate water allocation in India. The study also discusses the potential for greater utilization of water resources in India, reviews political and administrative historical highlights of federal-state and interstate water resources management characteristics in that country, and calls for establishment of an Indian national water resources council. The methodology adapted from Mitsuosuzuki and Mikonakayama (1976) fixes fair distribution of costs and benefits as a linear programming problem involving calculation of the minimum cost of a coalition of state governments in meeting water requirements, posited against the minimum cost of an individual state in meeting those requirements without cooperative assistance. Provision is also made for physical, political and institutional constraints. Application to certain present-day Indian interstate water allopointeal and institutional constraints. Appreciation to certain present-day Indian interstate water allocation disputes shows that this approach can provide negotiation solutions only in limited cases. In federal-state relationships it is useful only where there are no national competing claims on a water supply sought by a state. To mediate in these latter disputes, a national water resources council is proposed which would be coordinated by the national government. Indian states, fearing control of such a council by the national government, have strongly opposed such a scheme. (Harris-Wisconsin)

W80-03142

UNCERTAINTY AND ALLOCATION DECISIONS INVOLVING UNIQUE ENVIRONMEN-TAL RESOURCES, North Carolina Univ. at Chapel Hill. Dept. of

For primary bibliographic entry see Field 6B. W80-03146

FLOW ROUTING IN THE SUSQUEHANNA RIVER BASIN: PART II LOW-FLOW FREQUENCY CHARACTERISTICS OF THE SUSQUEHANNA RIVER BETWEEN WAVERLY, NEW YORK AND SUNBURY, PENNSYLVA-

NIA, Geological Survey, Harrisburg, PA. Water Resources Div.

Sources Liv.

D. L. Bingham.

Available from the National Technical Information
Service, Springfield, VA 22161 as PB-301 392,
Price codes: A03 in paper copy, A01 in microfiche.
Geological Survey Water-Resources Investigations
79-52, June 1979. 31 p, 17 Fig, 6 Tab, 5 Ref.

Descriptors: "Model studies, "Low-flow frequency, "Flood routing, "Streamflow, "Simulation analysis, New York, Pennsylvania, Frequency curves, Analytical techniques, Evaluation, Flow rates, Gaging stations, "Ungaged sites, "Susquehanna River basin(PA), Susquehanna River Basin

Six flow-routing models were developed, calibrated, and verified for the Susquehanna River between Waverly, New York, and Sunbury, Pennsyltween Waverly, New York, and Sunbury, Pennsylvania. The models give the Susquehanna River Basin Commission tools to estimate effects of water-resource developments upstream from Waverly upon four gaged sites and two ungaged sites within the study reach. The models were used to stimulate a 32-year record of daily flows at the two ungaged sites. Low-flow frequency curves for simulated flows at these sites were used to estimate 7-day low-flows at the 10-year recurrence interval of 540 and 770 cubic feet per second, respectively. The model errors, differences between model results and observed streamflow at gaged sites, are considered to be within reasonable limits and overall quality of simulated streamflow and low-flow frequency curves is considered good. (Woodardfrequence USGS) ncy curves is considered good. (Woodard-W80-03163

ESTIMATED DRAWDOWNS IN THE FLORI-DAN AQUIFER DUE TO INCREASED WITH-DRAWALS, DUVAL COUNTY, FLORIDA, Geological Survey, Tallahassee, FL. Water Re-

sources Div.

B. J. Franks, and G. G. Phelps.

Available from the National Technical Information
Service, Springfield, VA 22161 as PB80-119860,
Price codes: A04 in paper copy, A01 in microfiche.
Geological Survey Water-Resources Investigations
79-84, 1979. 22 p, 6 Fig. 3 Tab, 24 Ref.

Descriptors: *Drawdown, *Projections, *Aquifers, *Withdrawal, *Analytical techniques, Aquifer characteristics, Hydrogeology, Transmissivity, Storage coefficient, Permeability, Saline water intrusion, Groundwater, Aquifer management, Regression analysis, Simulation analysis, Florida, *Floridan aquifer, *Dade County(FL).

Hydrologic investigations of the Floridan aquifer in Duval County, Florida, have shown that an appropriate simplified model of the aquifer system consists of a series of sub aquifers separated by semipermeable beds. Data from more than 20 aquifer tests were reanalyzed by the Hantush modified method, which takes into account leakance from all confining units. Transmissivity values range from 20,000 to 240,000 square feet per day. Leakance was estimated to be 2.5x10 to the minus 6th power and 3.3x10 to the minus 6th power and 3.3x10 to the minus 5th power per day for the upper and lower confining units, respectively. Families of steady-state distance-drawdown curves were constructed for three representative transmissivity values based on hypothetical withdrawals from a point source

ranging from 5 to 50 million gallons per day. Transient effects were not considered because the system reaches steady-state conditions within the time ranges considered. Drawdown at any point can be estimated by summing the effects of any hypothetical configuration of pumping centers. The accuracy of the parameters was checked by comparing calculated drawdowns in selected observation wells to measured water-level declines. (Woodard-USGS) W80-03165

6B. Evaluation Process

MEASURING THE RISKS OF WASTE DISPOS-AL BY DEEP-WELL INJECTION, Marquette Univ., Milwaukee, WI. C. H. Breeden.

C. H. Breeden.
Available from the National Technical Information
Service, Springfield, VA 22161 as PB80-139629,
Price codes: A03 in paper copy, A01 in microfiche.
Virginia Water Resources Research Center, Virginia Polytechnic Institute and State College,
Blacksburg, Bulletin 122, 1980. 42 p, 5 Fig, 3 Tab.
28 Ref. OWRT A-066-VA(2).

Descriptors: "Waste disposal, "Injection wells, "Economic feasibility, Evaluation, "Deep-well waste disposal, Environmental risk.

Much research has been conducted previously on the direct physical costs and the economic effects of changes in operating criteria and design param-eters for deep-well waste disposal systems. Howev-er, many important considerations, such as the evaluation of risk in the design and operation of a disposal well, have received less attention. This dy addresses these injection well failure data, sich are important to both industrial and public which are important to both industrial and public policy decisionmakers who need to assess the genuine economic feasibility of this disposal method. In addition to identifying the direct costs of deep-well waste disposal, the study (1) illustrates ways in which a decisionmaker might quantify the risks associated with waste injection in an attempt to make these contingent costs explicit, and (2) presents computations for the indirect costs of uncertain risks by using an expected value technique and applying it to several hypothetical circumstances. W80-03005

THE PROBLEM OF DROUGHT IN BOTSWA-

NA, University Coll. of Botswana, Gaborone. Dept. of

In: Proceedings Symposium on Drought in Bo-tswana, June 5-8, 1978, Gaborone. Published by the Botswana Society in collaboration with Clark University Press. p 7-20, 1979. 23 Ref.

Descriptors: *Droughts, *Botswana, *Thermal stress, *Arid climates, Crop response, Water shortage, Weather patterns, Africa, Comprehensive planning, Soil properties.

The drought-sensitive country of Botswana can be characterized by a lack of rainfall severe enough, of long enough duration, and of wide enough extent throughout the country to have a deleteriextent throughout the country to have a deleterious effect on plant growth, as well as on water supplies for stock use, domestic use, and urbanindustrial-mining purposes. Given the poor, erratic, and unreliable nature of its rainfall, along with generally poor-quality soils, Botswana is threatened continuously by potential water shortage stress. Several aspects of this stress are reviewed here to define drought in terms appropriate to Botswana, including its historical patterns, water supply and demand, its relation to man and animal, government research and policy, education, legislation and implementation; and to examine some of its physical aspects and elucidate its causes. (Tickes-Arizona)

DROUGHT SUSCEPTIBILITY SURVEY AND THE CONCEPT OF MONITORING LAND-SCAPE ECOLOGY,

Field 6—WATER RESOURCES PLANNING

Group 6B—Evaluation Process

International Inst. for Aerial Survey and Earth Sciences, Enschede (Netherlands).

H. Th. Verstappen.
In: Proceedings Symposium on Drought in Botswana, June 5-8, 1978, Gaborone. Published by the Botswana Society in collaboration with Clark University Press. p 75-81, 1979. 4 Fig.

Descriptors: *Droughts, *Monitoring, *Comprehensive planning, *Remote sensing, Seasonal, Mapping, Botswana, Surveys.

The evaluation and planning of drought relief in arid and semiarid lands require that complex and diversified factors of anthropogenic as well as climatic nature be continuously monitored. Various modes of remote acquisition of environmental data including the use of aerospace technology to inventory, classify, and evaluate the ecological situation in these drought-prone regions are reviewed here to indicate that careful selection of the most appropriate techniques for specific suppress such here to indicate that careful selection of the most appropriate techniques for specific purposes, such as observation of seasonal variations, drought susceptibility classification, and quantification of the desertification process, is essential in obtaining optimum results. It is hoped that a drought susceptibility map of the whole of Botswana and other countries as well will ultimately become available as an operational tool in combatting the adverse effects of drought. (Tickes-Arizona)

DROUGHT IN THE SAHEL: A BROADER IN-TERPRETATION, WITH REGARD TO WEST AFRICA AND ETHIOPIA, International African Inst., London (England). H. I. Wetherell, J. Holt, and P. Richards.

In: Proceedings Symposium on Drought in Bo-tswana, June 5-8, 1978, Gaborone. Published by the Botswana Society in collaboration with Clark University Press. p 131-141, 1979. 4 Fig. 17 Ref.

Descriptors: *Droughts, *Africa, *Sahel, *Pasture management, *Rural sociology, Semiarid climates, Weather data, Economic impact, Social aspects, Monitoring, Rainfall, Planning.

An examination of the recent work on drought in Africa indicates (1) a tendency to underestimate the extent to which drought disaster-proneness re-lates to and derives from social and economic lates to and derives from social and economic factors, and (2) a growing awareness of the importance of drought and rainfall unreliability in areas outside the low rainfall extremities of the semiarid zone. To gain a wider appreciation of drought in Africa, areas in Nigeria and Sierra Leone, where climates are quite different from the Sahel proper, and in Ethiopia, where superficial similarities with the Sahel may hide basic differences, are analyzed. At present, the true complexity of Africa's drought phenomenon, in terms of spatial and temporal rainfall fluctuations and their social and economic impact, is inadequately reflected in data from the continent's parse network of rainfall stations. continent's sparse network of rainfall stations These authors suggest that much may be gained neese authors suggest that much may be gamed, nevertheless, from a policy of incorporating local observations and perceptions into drought and rainfall monitoring work. In the absence of high technology monitoring devices, there is every reason why farmers should maintain their traditional close observation to minimize the risks involved in recurrent droughts, and governments and planners would do well to recognize how much they have to learn directly from local farmers and herdsmen. (Tickes-Arizona) W80-03068

EXPERIENCE OF DROUGHT IN THE SAHEL

REGION, Regional Centre for Training and Application of Agrometeorology and Operational Hydrology, Niamey (Niger). D. Riiks

In: Proceedings Symposium on Drought in Bots-wanna, June 5-8, 1978, Gaborone. Published by the Botswana Society in collaboration with Clark University Press. p 142-146, 1979.

UMI

Descriptors: *Droughts, *Networks, *Regional analysis, *Environmental effects, Water supply, Information exchange, Vegetation effects, Sahel,

Rainfall and drought patterns, the causes of drought and the methods available for dealing with drought in the Sahel are discussed. Drought, de-scribed here as a situation in which lack of availascribed here as a situation in which lack of availa-ble water significantly impairs the routine human activities that occur in normal years, including arable farming, livestock husbandry, domestic water supply, health, navigation, and electricity generation, is largely caused in the Sahel by basic meteorological factors. Actions possible for deal-ing with drought in certain circumstances are mulmeteorological factors. Actions possible for dealing with drought in certain circumstances are multiple, varying according to the physical situation at any one time and place. These actions and their means of implementation are enumerated, with the emphasis largely on the necessity of defining a course of future action to alleviate the detrimental effects of drought. Fundamentally this means a qualitative assessment of the availability of water in the Sahel and the state of vegetation as a result of this water availability. The author's recommendations rest largely on the establishment of information networks between countries affected, including stations where observations on meteorology, hydrology, vegetation, crop growth, and liveogy, hydrology, vegetation, crop growth, and live-stock conditions can be made and disseminated daily on an area-wide scale, not only to govern-ments but by radio, perhaps, to individual herds-men and farmers. (Tickes-Arizona)

BIOLOGICAL BASIS FOR ASSESSING IMPACTS OF CHANNEL MODIFICATION: IN-PACIS OF CHANNEL MODIFICATION: IN-VERTEBRATE PRODUCTION, DRIFT, AND FISH FEEDING IN A SOUTHEASTERN BLACKWATER RIVER, Georgia Inst. of Tech., Atlanta. Environmental

Georgia Inst. of Tech., Atlanta. Environmental Resources Center. A. C. Benke, D. M. Gillespie, and F. K. Parrish. Available from the National Technical Information Service, Springfield, VA 22161 as PB80-139793, Price codes: A10 in paper copy, A01 in microfiche. Report No. ERC 06-79. 201 p. 33 Fig. 33 Tab, 211 Ref., 3 Append. OWRT B-105-GA(1).

Descriptors: *Georgia, *Invertebrates, *Secondary productivity, *Food chains, Population, Standing crops, Food abundance, Environmental effects, Biomass, Aquatic productivity, Aquatic insects, Fish food organisms, Channeling, Aquatic drift, Aquatic habitats, Satilla River.

Invertebrate production dynamics in the Satilla River in Georgia were studied to determine the effect of channelization or other river alterations effect of channelization or other river alterations on animal diversity, productivity, and general river ecology. The 362 km blackwater river has a drainage basin of 9143 sq km with good to excellent water quality. Invertebrates were studied in three major habitats: snags, submerged wooden substrates; the main channel, sandy benthic conditions; and the muddy benthic habitat of backwater areas. Sampling was conducted at two sites on the river, one near Waycross 290 km from the Atlantic Ocean and one at Atkinson 129 km from the ocean. Samples taken to determine the relative impor-Samples taken to determine the relative impor-tance of the various invertebrate habitats included: (1) quantitative sampling to estimate invertebrate production; (2) invertebrate drift sampling with notation of habitat of origin for drift organisms; and (3) sampling of the feeding habits of major fish species to determine trophic pathways and the habitats of origin of the fish. Results show that the snag habitat had the greatest species diversity, carefiling stock biomass and total production with standing stock biomass, and total production with weights of 57 to 72 g dry wt/sq m. Drift samples revealed that approximately 80% of the animals found in the drift originated from the snags. Drift densities were high compared to other rivers with roughly 3 invertebrates/c um. The major insecti-vorous fish species, redbreast, bluegills, and largewith the major insectiment bass, are largely dependent upon snags as sources of food. Due to this importance to invertebrates, the removal of snag habitats and/or channelization of the river would cause a significant decline in animal diversity and productivity. (Seigler-IPA) W80-03078

PROVIDING RURAL WATER: CONSTRAINTS AND IMPACTS, Cornell Univ., Ithaca, NY. Dept. of Agricultural Economics.

D. Allee, H. Capener, J. Francis, and B. Brower.
In: Water Problems in the Rural Environment;
Alternative Solutions for Water Supply and
Wastewater Disposal. Proceedings of a Conference
Held at Lincoln, Nebraska, on November 4-5, 1976. p 27-36.

Descriptors: "Social aspects, "Rural sociology, "Water supply development, "Social impact, "Na-tional Demonstration Water Project, Community development, Rural areas, Water supply, Sewer-age, Water allocation(Policy), Domestic water, Potable water, Economic, Economic impact, Social adjustment, Local governments, Social needs, Social values, Social participation, Water users, Water utilization.

users, Water utilization.

Social constraints and impacts of providing rural water, collected as part of the National Demonstration Water Project, are summarized. When constraints are removed from rural water development, impacts are produced. Many constraints exist on rural water development; however, most are site-specific. One important impact of water development projects is the production of local community leaders. Community development is stimulated in the long run by leaders who not only solve water problems but other community problems. Passing bond issues is used as an example of trust between community members and their leadership. For the national statistical assessment, a general model of household users and community situations is being developed. The model identifies key household variables for sufficient water quantity and quality. The model reflects not only persons on community water systems but also those located on individual water sources. Social-cultural factors and regional attitudes are considered. Household size, composition, and plumbing type are also realized. tors and regional attitudes are considered. Household size, composition, and plumbing type are also included. Various water uses such as drinking, bathing, doing dishes and laundry, water for livestock and gardens, car washing, and lawn watering are also listed. Community assessment consists of identifying a physical problem (lack of water, pollution due to inadequate sewers) the community's awareness of it and whether they have resources available to cope with it. Resources include social resources such as organizational capability and physical resources such as money. (See also W78-11244) (Danovich-Wisconsin)

RURAL WATER: STATE PROGRAMS, North Dakota Association of REC's, and RTC's, Mandan.

Mandan.
J. Ketterling.
In: Water Problems in the Rural Environment,
Alternative Solutions for Water Supply and
Wastewater Disposal. Proceedings of a Conference
Held at Lincoln, Nebraska on November 4-5, 1976.

iptors: *Water supply development, *Rural *North Dakota, *South Dakota, *Minnesota, areas, "North Dakota, "South Dakota, "Minnesota, Water supply, Community development, Domestic water, Potable water, State governments, Social needs, Water users, Water utilization, Water quality, Water resources, Water resources development, Governmental interrelations, Costs.

This paper discusses North Dakota, South Dakota, and Minnesota programs on rural water systems development. In North Dakota, underground water quality is extremely poor and quantities are inadequate for basic domestic and livestock needs. North Dakota also faces large-scale coal development. Rural water systems development began in 1971; today four systems are operational, four are under construction, and two other cooperative associations have tentative funding approval from under construction, and two other cooperative as-sociations have tentative funding approval from the Farmers Home Administration. Water re-sources management is under direction of a seven-member commission appointed by the governor; however, no clearly defined coordination exists between the departments of Health and Agriculhowever, no clearly defined coordination exists between the departments of Health and Agriculture and the State Water Commission. Water systems operate under extreme financial pressures because of increasing material and labor costs and the need to bury water lines a minimum of seven feet to prevent winter freeze-up. Average household water bills amount to \$25-35 for 6,000 gal/mo.

Evaluation Process—Group 6B

Experiences in South Dakota are similar with costly installation for rural water systems due to six feet minimum burial of water lines and the sparse population. More rural water systems are now being organized in both North and South Dakota. Minnesota problems include a lack of adequate well records, funds for tests drilling, and technical assistance. Rural electric cooperatives fully support efforts to obtain good quality domesreclinical assistance. Rural electric cooperatives fully support efforts to obtain good quality domestic water for rural families and communities. (See also W78-11244) (Danovich-Wisconsin) W80-03127

ASSURING ADEQUATE SUPPLY: QUANTITY AND QUALITY, Nebraska State Dept. of Health, Lincoln. Div. of Environmental Engineering.
For primary bibliographic entry see Field 6D.
W80-03129

ALTERNATIVE WATER SUPPLY SYSTEMS IN RURAL AREAS, Iowa State Univ., Ames. Dept. of Civil Engineer-

Ing.
T. A. Austin.
In: Water Problems in the Rural Environment;
Alternative Solutions for Water Supply and
Wastewater Disposal. Proceedings of a Conference
Held at Lincoln, Nebraska on November 4-5, 1976.
p 61-72- 2 Fig. 3 Tab, 4 Ref.

Descriptors: *Alternative planning, *Iowa, *Rural areas, *Water supply development, *Economics, Costs, Economic efficiency, Water supply, Water quality, Wells, Regional planning, Regional development, Regional analysis, Domestic water, Potable water, Economic *Costalian Conomic *Costalian Conomic *Costalian Costalian Costali

This paper discusses relative economies of three alternative rural water supply systems; individual wells, cluster wells and regional wells. No single system is judged best in all cases. Individual wells generally are the most economical solution, progenerally are the most economical solution, provided an adequate supply of good quality water can be obtained from shallow wells. If shallow groundwater resources are limited, cluster wells provide some economy of scale by spreading capital costs over a greater number of users. Regional rural water systems require much larger investments per user. Operational efficiency is higher for cluster wells and regional systems than individual systems. A rough comprison of relative costs of alternative systems was made in a hypothetical area in north central lowa where farms are far apart, the aquifer is 200 feet deep, and water is very hard (613 mg CaCO3/I) and has high iron contents (3 mg/I). An individual well costs \$26.22/roo; this does not include funds set aside for repair or equipment maintenance. A cluster well system or equipment maintenance. A cluster well system costs \$25.34/mo which is less than an individual costs \$25.34/mo which is less than an individual well system. Costs for 8000 gal/mo from three rural water systems currently in Iowa range \$26.05-\$31.78. Central regional systems advanages include economies of scale, in well and treatment plant, centralized operation and management, and ability to use more sophisticated treatment processes. Regional system capital cost per user is high but monthly costs are not significantly higher than other alternatives. (See also W78-11244) (Danovich-Witcensin) vich-Wisconsin) W80-03130

THE ECONOMICS OF RURAL WATER

SUPPLY, West Virginia Univ., Morgantown. Regional Re-

West Virginia Univ., Morgantown. Regional Research Inst.
P. C. Mann.
In: Water Problems in the Rural Environment;
Alternative Solutions for Water Supply and
Wastewater Disposal. Proceedings of a Conference
Held at Lincoln, Nebraska, on November 4-5,
1976. p 91-100. 6 Ref.

Descriptors: *Rural areas, *Water supply, *Economies of scale, Economics, Costs, Financing, Population, Size, Capital costs, Operating costs, Distribution, Maintenance costs, Production, Water treatment, Water supply development, Rates, Consumption, Water utilization, Investment, Social as-

Rural water problems are derived from low percapita incomes coupled with higher costs per consumer connection. Financing problems in rural water supply are largely linked to size disadvantages. Rural systems serving populations less than 10,000 constitute 94% of all water systems but account for less than 20% of population served by all water systems. Most rural communities lack funds needed to absorb initial costs and some even have difficulty covering sustaining costs such as operation and maintenance. For rural water systems, smallness in size tends to preclude potential economies of scale in source of supply, transmission, and treatment. This results in higher operation and capital investment costs on both per user and per output unit basis than for larger urban systems. The market characteristic of low user density means higher initial costs per connection. Low density also means increased transmission. Low density also means increased transmission costs per connection in periodic system maintenance. Rural water systems generally have users with lower incomes than consumers in urban systems. Less affluent customers consume less water per capita, thus precluding economies of scale in production and distribution. Different types of rate structures such as flat charge, uniform, declining block, and inverted block rates are discussed. Social pricing such as lifeline rates and utility stamps are also mentioned. (See also W78-11244) (Danovich-Wisconsin) Danovich-Wisconsin) 780-03132

SOME ASPECTS OF MANAGEMENT-RURAL

WATER SYSTEMS, Utility Management Service, McComb, MS. C. C. Hale.

C. C. Haie.

In: Water Problems in the Rural Environment;
Alternative Solutions for Water Supply and
Wastewater Disposal. Proceedings of a Conference
Held at Lincoln, Nebraska on November 4-5, 1976.

Descriptors: *Water supply, *Management, *Rural area, *Potable water, Water quality, Public health, Costs, Safe Drinking Water Act, Regional planning, Planning, Standards, Water supply development, Taxes, Size, Economies of scale, Water treatment, Distribution, Personnel.

A critical weakness in delivering safe drinking water to rural areas is the lack of management. The purpose of community water systems is to provide adequate supply of safe potable water on a continuous basis and at the lowest cost to consumcontinuous basis and at the lowest cost to consumers. A serious deficiency exists in the lack of measurement standards for a water system's performance. Generally accepted criteria do not exist, although the Safe Drinking Water Act of 1974 will correct major abuses. Most states do not require licenses for water systems managers. Many system operating costs are subsidized by tax revenues. If tax subsidies are not used, management must run water systems on careful budgets. Another major handicap is that lack of overall planning, results in systems which cannot accommodate normal growth without extensive plant and distribution rebuilding. A problem unique to rural water sysrebuilding. A problem unique to rural water sys-tems is small size and problems of scale. Operating dispersed wells and treatment plants adds to cost and complexity. Early warning systems are needed for malfunctions in order to cope with crises. (See also W78-11244) (Danovich-Wisconsin) W80-03134)

MANAGEMENT OF WATER RESOURCES -CO-OPERATIVE GAME-THEORETIC A PROACH TO INTER-STATE PROBLEMS, For primary bibliographic entry see Field 6A W80-03142

THE USE OF DEVELOPMENT VALUE ESTI-MATES FOR COASTAL WETLAND PERMIT DECISIONS,

Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
L. Shabman, and M. K. Bertelson.
Land Economics, Vol 55, No 2, p 213-222, May 1979. 1 Tab, 20 Ref.

Descriptors: *Wetlands, *Market value, *Land development, *Methodolgy, *Estimating equations,

Coastal marshes, Permits, Decision making, Costs, Benefits, Land use, Virginia, Virginia Beach(VA), Planning, Economic efficiency, Value, Regression analysis, Least-squares/method, Wetland filling.

Readily available courthouse records are the data source for an inexpensive procedure for estimating development values of wetlands; the procedure provides economic information about preservation and development uses of marshland for greating of provides economic information about preservation and development uses of marshland for granting of wetland alteration permits. A hedonic price equation, which includes a variable to measure the level of waterfront amenity created from filled coastal marsh, predicts the value derived from filling wetlands for residential development. The net value for development, which is calculated by subtractive development, and the property core are the conservated to the for development, which is calculated by subtracting development cost, can be compared to the value of natural wetland. The equation was tested using standard regression techniques and data for land parcel sales in Virginia Beach, Virginia. Neighborhoods selected for study were socioeconomically homogeneous as possible to reduce the number of variables. The transfer price of a parcel, which represents the present value of the flow of annual returns, was used instead of prices to account for changes over time. Transfer prices are treated as a function of: (1) location factors; (2) historical factors; (3) improvements; and (4) site amenities. A hypothetical situation applied to the Virginia Beach example results in a net development benefit of \$8,232/acre. This value must then be compared to the more elusive value of wetland be compared to the more elusive value of wetland preservation, which is formatted in terms of rising marginal value, irreversibility, and uncertainty, to determine if a permit should be granted. (Luedtke-W80-03144

UNCERTAINTY AND ALLOCATION DECISIONS INVOLVING UNIQUE ENVIRONMEN-TAL RESOURCES,
North Carolina Univ. at Chapel Hill. Dept. of

Journal of Environmental Economics and Manage-ment, Vol 6, No 3, p 175-186, 1979. 31 Ref.

Descriptors: *Economics, *Investment, *Optimization, *Risks, *Resource allocation, Decision making, Environmental effects, Equations, Mathematical models, Cost-benefit analysis, Projects, Externalities, Planning, Conservation, Project planning, Resources, Regional development.

Modeling of uncertainty affects decision rules for irreversible investments, thus it is important to consider causes of uncertainty. This paper extends consider causes of uncertainty. This paper extends Fisher's work to account more directly for effects of the treatment of uncertainty along with irrever-sibilities in determining optimal investment deci-sions regarding environmental quality problems. Conventional benefit-cost analysis is oriented mainly toward appraising individual projects. Methodologies which treat each project in isolation lead to inconsistent decision-making where uncertainty is a significant constituent. These planuncertainty is a significant constituent. These plan-ning rules also ignore the potential for risk pooling across projects. These methodological inadequa-cies remain valid even with Fisher's modification of the Arrow-Lind theorem. Uncertainty arises because planners must estimate net benefits from a given mix of developed and preserved natural en-vironments. Both scale and time of optimal invest-ments may both he altered from those prescribes. ments may both be altered from those prescribed with conventional (Fisher-Krutilla-Cicchetti rule) frameworks when the potential for risk pooling is introduced. (Danovich-Wisconsin) W80-03146

TECHNIQUES FOR REAL-TIME OPERATION OF FLOOD CONTROL RESERVOIRS IN THE MERRIMACK RIVER BASIN, Hydrologic Engineering Center, Davis, CA. B. S. Eichert, J. C. Peters, and A. F. Pabst. Technical Paper No 45, November 1975. 43 p, 18

Descriptors: *Reservoir operation, *Systems analysis, *Flood control, *River regulation, Computer models, Streamflow forecasting, Simulation analysis, Flood damage, Forecasting, Analytical tech-

Field 6-WATER RESOURCES PLANNING

Group 6B—Evaluation Process

niques, Hydrologic systems, River basins, Discharge(Water), New England, Merrimack River Basin, Case studies, Real-time operation.

This paper contained a description of the techniques that are under development at The Hydrologic Engineering Center for providing decision criteria on a real-time basis for operating the five flood control reservoirs in the Merrimack River basin. Techniques under development include: (1) testing of alternative streamflow forecasting models; (2) application of computer program HEC-5C, Simulation of Flood Control and Conservation Systems, to develop decision-criteria for system operation on a real-time basis; and (3) use of computer terminals to enable analysis of alternative aystem operation on a real-time basis; and (3) use of computer terminals to enable analysis of alternative forecast and/or decision criteria in both batch mode and interactive applications. Each of these techniques were discussed following a brief description of characteristics of the basin, reservoir system, and automatic data collection network. (Humphreys-ISWS)
W80-03198

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE IMPACTS OF RURAL WATER SYSTEMS IN NORTH CAROLINA: AN EXPLORATORY STUDY.

North Carolina Univ. at Chapel Hill. Center for Urban and Regional Studies.

B. J. M. Knopf, J. E. McKinnon, and R. J. Burby. Available from the National Technical Information Available from the National reclimical information Service, Springfield, VA 22161 as PB80-140072, Price codes: A07 in paper copy, A01 in microfiche. Water Resources Research Institute, University of North Carolina, Raleigh, Rpt No 151, November 1979, 120 p, 7 Fig. OWRT A-103-NC(1), 14-34-0001-0035 0001-9035

Descriptors: "Rural water systems, Investment decision-making, Impact assessment, Secondary impacts, Land use, Induced growth, Regionalization, Economic feasibility, Social impact, Environmental effects, "North Carolina, Rural communities, Water cutter." Water systems

As a result of increasing rural community demand As a least of increasing that concern exists that the installation of rural water systems will induce sprawl development with detrimental impacts. This report presents the results of a study on the formation, expansion and impacts of rural water systems in expansion and impacts of rural water systems in N.C. in an attempt to strengthen decision-making and project review procedures related to rural water systems. The findings indicate that local decisions regarding the formation and expansion of rural water systems have been based on present and anticipated needs and engineering and financial feasibility analyses. Decisions rarely included factors related to capital improvement budgeting and planning or long-term costs to communities of providing sewerage and other services required by the subsequently induced new development. The authors suggest there is a need for increased atten-tion to local needs, goals and objectives related to location and timing of rural growth. Further, that county land classification plans would enhance the process as well as facilitate suggested local and regional review of proposed water investment plans. W80-03003

ALTERNATIVE WATER SUPPLY SYSTEMS IN RURAL AREAS,

Iowa State Univ., Ames. Dept. of Civil Engineer-For primary bibliographic entry see Field 6B. W80-03130

ECONOMICS OF RURAL WATER SUPPLY, West Virginia Univ., Morgantown. Regional Re-

search Inst For primary bibliographic entry see Field 6B.

JMI

EXECUTIVE SUMMARY: WORKSHOPS ON SOCIO-ECONOMIC ASPECTS, Nebraska Univ., Lincoln. Dept. of Agricultural

R. J. Supalla.

In: Water Problems in the Rural Environment;
Alternative Solutions for Water Supply and
Wastewater Disposal. Proceedings of a Conference
Held at Lincoln, Nebraska, on November 4-5, 1976. p 119-122.

Descriptors: "Water supply, "Rural areas, "Conferences, "Social aspects, "Economic impact, Planning, Water supply development, Zoning, Land use, Financing, Pricing, Management, Water quality, Standards, Water rights, Governments, Local governments, Public health, Economics, Costs, Rates.

Workshops on water problems in rural areas ad-dressed socio-economic issues classified in nine cat-egories: (1) water system development and planegories: (1) water system development and planning, (2) zoning and land use impacts, (3) water system financing, (4) water pricing, (5) role of water system financing, (4) water pricing, (5) role of water system managers, (6) water quality standards, (7) impact of section 208 planning, (8) the rural water survey, and (9) water rights. Participants questioned the proper role of the Farmers Home Administration and felt the agency should assume some responsibility for successful administration of water systems they finance. Two widely held views are that local level administrative control is important and that increasingly careful water systems planning is needed to meet public health standards. Another major concern is coping with induced residential developments that occur along water lines. Most participants agreed that water systems should be financed through private enterprise with government subsidies used only as a backup. Also government agencies should conenterprise with government subsidies used only as a backup. Also government agencies should consider social as well as economic benefits in deciding which water system to finance. An expanded federal grants program is also needed. Lifeline rate structures while declining rates should be abolished. 208 water quality planning will have significant impacts on both surface and ground-water sources because it addresses nitrate groundwater accumulations as well as sedimentation and erosion accumulations as well as sedimentation and erosion problems. (See also W78-11244) (Danovich-Wis-

COMMENT ON 'THE EFFICIENCY AND EQUITY OF COST ALLOCATION METHODS FOR MULTIPURPOSE WATER PROJECTS'

BY JAMES C. LOUGHLIN, Environmental Protection Agency, Cincinnati, OH L. A. Rossman.

Water Resources Research, Vol 14, No 6, p 1195-1196, December 1978. 1 Tab, 2 Ref.

Descriptors: *Multiple-purpose projects, *Cost allocation, *Equity, *Efficiencies, Optimum development plans, Project planning, Economics, Costs, Separable cost allocation, Cost analysis, Monetary benefits, Model studies, Evaluation.

ent takes exception to Loughlin's (1977) (See W78-02186) examination of three schemes for allocating costs of multipurpose projects to indi vidual purposes with respect to a set of equity and efficiency criteria. Loughlin concluded that only the separable costs-remaining benefits (SCRB) method will satisfy the equity criterion. Two objections are raised: (1) Certain of the efficiency criteria should not be used for evaluating cost allocation methods; the criteria in question are allocation methods; the criteria in question are actually project evaluation criteria and should be applied to the project before any cost allocation is made. (2) Loughlin's adjusted SCRB method actu-ally gives less-equitable results than the original SCRB formula for projects where the justifiable costs with a purpose deleted are given by the alternative cost of providing all other purposes. A revised set of cost allocation criteria separate from the economic evaluation criteria and thus in keep-ing with the equity principles used by Loughlin ing with the equity principles used by Loughlin would be: (1) The sum of total costs allocated to each purpose should equal total project cost. (2) The total costs allocated to each purpose should not exceed the cost of a single purpose alternative providing equivalent benefits. (3) Savings allocated to each purpose should be in the same proportion as savings realized by including each purpose in the project. The remedy to the problem of the SCRB formula not satisfying the equity criterion is simply to redefine the separable cost of a purpose as the total project cost minus the justifiable cost with this purpose deleted. (Harris-Wisconsin) W80-03137

EFFICIENCY IN THE USE OF WATER FOR IRRIGATION: THE ROLE OF PRICES AND REGULATIONS, United Nations Centre for Natural Resources,

Energy and Transport, NY.
For primary bibliographic entry see Field 3F.
W80-03140

FINANCING YOUR POLLUTION CONTROL NEEDS

B. A. Rose. Industrial Finishing, Vol 54, No 12, p 12-15, December 1978

Descriptors: "Water pollution, Control, "Equipment, "Electroplating industry, "Small businesses, "Financing, "Bond issues, "Loans, "Government finance, Small Business Administration, Environmental Protection Agency, California, Illinois, Economics, Investment, Cost repayment, Credit, Installation costs, Interest rates, Government supports, Federal Water Pollution Control Act Amendments of 1972(PL 92-500), Industrial production, Industrial wastes, Industrial plants, Pollution abatement. tion abatement.

Tax-exempt pollution control revenue bonds and low-interest loans are two low-cost alternatives for financing the addition of pollution control equipment by electro-platers and other small business. For firms needing \$100,000 or more, the Small Business Administration (SBA) can guarantee payments on equipment loans or leases with funding through tax-exempt revenue bonds for existing small businesses of groups of businesses. By 1977, pilot programs were operative in California and Illinois, with state/local authorities issuing such bonds backed by SBA. Funds can be used for equipment and construction, bond issuance expenses, application feeds, reserve funding and refipenses, application feeds, reserve funding and refi-nancing of existing debts for equipment. However, procedures take more time than with a conventional loan and firms must not exceed certain size criteria, such as net worth, number of employees, income and other factors. For firms needing smaller loans (\$5,000-\$50,000), US Environmental Proer loans (\$5,000-\$50,000), US Environmental Protection Agency (EPA) may make loans for equipment to meet water pollution control requirements.
These loans are made to concerns likely to suffer
economic injury because of regulatory requirements. Various federal criteria must be satisfied for
eligibility, and no business can obtain an EPA loan
if reasonable conventional financing is available. In
addition, firms must meet small-size criteria as for adultion, firms must meet small-size criteria as for the SBA tax-exempt revenue bonds financing. Fed-eral loans and loan guarantees for industiral pollu-tion control equipment are also available from the Economic Development Administration and the Farmers Home Adminstration. (Harris-Wisconsin) W80-03145

MARKET METHODS OF MULTIPLE USE

RECONCILIATION,
Victoria Univ. (British Columbia). Dept. of Eco-

G. R. Walter. Journal of Environmental Management, Vol 7, No 3, p 291-296, November 1978, 2 Tab, 4 Ref.

Descriptors: *Pricing, *Market value, *Willing-ness-to-pay, *Land resources, *Recreation, *Multi-ple-purpose projects, Economics, Value, Elasticity of demand, Elasticity of supply, Recreation demand, Natural resources, Forest management, National parks, Camp sites, Boat-launching ramps, Hunting, Fishing, Recreation facilities, Leases.

Theoretical and practical questions of equity and efficiency are discussed in regard to evaluation and

Water Law and Institutions—Group 6E

pricing of certain multiple-use services provided by land resources (Such as wood production, wild-life management, watershed benefits, outdoor recreation, range products, and aesthetic considerations). It is suggested that most of these services are in fact marketable, and that many services could be supported by a system of user charges, permit fees or leasing. If there are many uses of a land area under public domain, a number of agencies may have obtained a proprietary interest by legislative mandate; unless there are some explicit measures of the welfare to be gained by the clientele served, so that their increase in welfare may be considered against the cost to the public purse, the result is likely to be an array of services determined solely by relative political strength. A number of basic revenue structures are available to achieve rational economic management of multiple-use services: (1) budgetary allocations out of general revenue (taxes); (2) monies obtained from bids or leases for an identifiable special-interest area such as a historical site, waterfall, small lake, etc; (3) permits for access to forest or other land-assed zones; (4) user's fees for use of a marketable services such as camping, picnics, boat launching. services such as camping, picnics, boat launching, etc.; and (5) road tolls for access to the overall multiple-use site or facility. (Harris-Wisconsin) W80-03147

MONOPOLY-POWER AS A MEANS FOR POL-LUTION-CONTROL.

A. Endres.
The Journal of Industrial Economics, Vol 27, No 2, p 185-187, December 1978, 5 Ref.

Descriptors: *Economic justification, *Monopoly, *Competition, *Regulation, *Pollution abatement, Economics, Externalities, Water pollution control, Polluter-pays principle, Competitive prices, Model studies, Abatement, Costs, Benefits.

Many resource economists traditionally hold that allocative distortions caused by monopoly power in the market place and external diseconomies compensate each other; this line of reasoning assumes that a polluting monopolist, producing too much as a polluter and too little as a monopolist, will develop a Pareto-optimal solution for control of pollution. However, this short paper illustrate in theory that monopoly power as a means for pollu-tion control is no more efficient in a perfectly competitive economy than taxes on output instead of pollution to accomplish the same task. It is noted that a polluting monopolist assumed to pro-duce optimal output will realize the optimal level of pollution only if output reduction is the sole means to reduce the externality. When other effi-cient measures are possible, monopoly power can never correct the allocative failure of an external disconnomy, even in theory, because the monopo-list will not use the efficient input mix. These points are demonstrated in a mathematical model of pollution outputs by a perfectly competitive firm and an unregulated monopolist. If firms of a firm and an unregulated monopolist. If firms of a perfectly competitive polluting industry are forced by a Pigovian tax to bear the marginal cost of the damage they cause, the Pareto-optical output and pollution level will be produced. However, with no Pigovian taxes and no other regulation, the monopolist has no incentive to employ any resources in additional abatement (such as installation of filters) which would compensate for the lack of tax reimbursement. (Harris-Wisconsin) W80-03148

6D. Water Demand

ASSURING ADEQUATE SUPPLY: QUANTITY

AND QUALITY, Nebraska State Dept. of Health, Lincoln. Div. of Environmental Engineering.

Environmental Engineering.
C. L. Summers.
In: Water Problems in the Rural Environment;
Alternative Solations for Water Supply and
Wastewater Disposal. Proceedings of a Conference
Held at Lincoln, Nebraska on November 4-5, 1976.

Descriptors: *Rural areas, *Water supply, *Water quality, *Potable water, *Water demand, Costs,

Water supply development, Domestic water, Reg-ulations, Water users, Water utilization, Water re-quirements, Consumptive use, Public health, Eco-nomics, Reliability, Safe Drinking Water Act, Groundwater, Cost-benefit analysis, Benefits,

Parameters for determining adequate water supply include water user needs, safety and health protection, reliability, and economic capability. User requirements vary 30-800 gal/d for per capita use in individual households. If groundwater resources are totally reserved for domestic use, sufficient quantities are available. Large withdrawals for industry, irrigation, and heavily populated areas reduce water resource accessibility for individuals. Natural groundwater filtering effectively removes bacteria and other microorganisms. Water quality often diminishes with well construction and installation methods. Nitrate nitrogen concentrations above 10 mg/l are associated with bacterial contamination. Assuring drinking water quality for individual water supply systems can be complex and costly, especially to comply with primary contaminant levels. The Safe Water Drinking Act of 1974 has significant social and economic implicataminant levels. The Safe Water Drinking Act of 1974 has significant social and economic implications. Mandating safe drinking water from private wells, beyond biological and nitrate parameters, requires large expenditures for enforcement while benefits are difficult to measure. In communities smaller than 100 population with a small water system, annual capital and operating costs for safe drinking water are expected to increase household monthly water bills \$3-23. As governmental control extends to small community and individual household systems, the benefit-cost approach or cost-effectiveness must be defined and presented, in an acceptable manner to consumers. (See also W78-11244) (Danovich-Wisconsin)

THE ECONOMICS OF RURAL WATER SUPPLY, West Virginia Univ., Morgantown. Regional Re-For primary bibliographic entry see Field 6B. W80-03132

EXECUTIVE SUMMARY: WORKSHOPS ON TECHNOLOGICAL ASPECTS,
Cornell Univ., Ithaca, NY. Dept. of Agricultural

Engineering, W. J. Jewell.

In: Water Problems in the Rural Environment; Alternative Solutions for Water Supply, and Wastewater Disposal. Proceedings of a Conference Held at Lincoln, Nebraska on November 4-5, 1976. p 111-117. 5 Ref.

Descriptors: "Conferences, "Water supply, "Rural area, "Research priorities, Governments, Political aspects, Water demand, Nitrates, Water pollution, Standards, Water rights, Nebraska, Social aspects, Water pollution control, Technology, Economic impact, Future planning(Projected), Groundwater, Safe Water Drinking Act, Sewage sludge, Sewage disposal, Education disposal, Education

This paper reviews progress in rural water systems, summarizes workshop activities and suggests tents, summatizes workshop activities an suggests topics for additional research. Rural water problems are now given greater attention by private groups as well as governmental agencies. Political entities of rural water districts and natural resource entities of rural water districts and natural resource districts significantly increase capabilities to deal with rural environmental quality problems. Since Nebraska and its neighboring states were experiencing a serious drought, this was discussed almost exclusively in workshops. Conference workshop conclusions are divided into water supplies and needs, and wastewater control. A common problem is activitative. lem is anticipating growth and future water supply demands. The primary water quality concern is contamination with nitrates. Drinking water stand-ards need to be enforceable and easily understood. A better working definition of 'right to water' is need to guide rural water program implementation. Preventing nitrate entry to groundwater and septic tank pollution control were also discussed. One important rural water research need is to define more clearly relationships between technicalsocial-economic issues and to relate these to re-source development and utilization. Widespread education programs are needed to support the Safe Water Drinking Act. Several key technological alternatives for pollution control are needed, most amportantly for nitrate removal from drinking water. Little is also known about effects of private usage of sewage sludge for ultimate disposal. (See also W78-11244) (Danovich-Wisconsin) W80-03135

6E. Water Law and Institutions

LEGAL RIGHTS TO SEWAGE EFFLUENT.

LEGAL RIGHTS TO SEWAGE EFFLOARS,
D. Sliz, and S. Powell.
Available from the National Technical Information
Service, Springfield, VA 22161 as PB80-139603,
Price codes: A05 in paper copy, A01 in microfiche.
Water Resources Research Center, University of
Arizona, Tucson. Project Completion Report, October 15, 1979. 76 p. 196 Ref. OWRT A-090APIZ(1) ARIZ(1).

Descriptors: *Water reuse, *Reclaimed water, *Arizona, *Sewage effluents, Sewage districts, Water users, Water rights, Legal aspects, Water shortage, Groundwater recharge, Aquifers, Legislation, Groundwater mining. Sewage, Water management(Applied), Potential water supply.

The legal aspects of waste water recapture or reuse are examined for the Tucson, Arizona, area, however, the legal problems examined are not limited exclusively to this area. The sole source of water supply for Tucson is pumped groundwater from the alluvial basin of an intermittent stream, the Santa Cruz. Due to the limited water resources of the area problems over the legal rights of the city and county to control sewage effluent from the city have developed. In the past treated effluent was discharged into the Santa Cruz stream bed for recharge of the aquifer. The city now plans to recapture and reuse or exchange the effluent. However, Pima County has contracted with an irrigation district to sell treated effluent from the Ina Road plant which is located in the county but Ina Road plant which is located in the county but treats city waste water. The city of Tucson has filed a complaint to prevent the county control of effluent originating in the municipal system. There are also other actual and potential conflicts over disposition and use of effluent. Case law and selected statutes which currently govern recapture are analyzed and the right of the city to use and to nanyzeu and the right of the city to use and to reuse water pumped from the Santa Cruz basin is examined. It is concluded that sewage effluent rights need to be defined or clarified by statute. Recommendations of appropriate legislation are provided. (Seigler-IPA) W80-03009

CONTROLLING LAND USE FOR WATER MANAGEMENT AND URBAN GROWTH MANAGEMENT: A POLICY ANALYSIS, California Univ., Davis. S. I. Schwartz, R. A. Johnston, J. R. Blackmarr,

and D. E. Hanser

Available from the National Technical Information Avanaoe from the National recamical mitorination Service, Springfield, VA 22161 as PB80-139538, Price codes: A05 in paper copy, A01 in microfiche. California Water Resources Center, University of California, Davis, Contribution 180, December 1979, 80 p. (California Water Resources Center Project UCAL-WRC-W-487).

Descriptors: *Land use, *Water resources, *Control, *Urbanization, Planning, *Political constraints, Constraints, Political aspects, Taxes, Zoning, Economics, Water resources develop-

This study reviews 18 land use control measures for application in water resources and urban growth management. The measures are carefully described and the evaluation literature is reviewed. described and the evaluation iterature is reviewed.

An evaluation process and framework are then proposed. Existing evaluation methods were found deficient with respect to the requirements of this particular situation therefore a new method is proposed that 'is based in part on Exizonis' mixed scanning approach and utilizes a two stage evalua-

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tion. The first stage consists of an initial scan tion. The first stage consists of an initial scan which examines potential effectiveness and feasibility and identifies the most promising alternatives. The second stage involves a more detailed analysis which focuses on other impacts as well as feasibility and effectiveness criteria. The emphasis of constraints to implementation, especially political, is a feature that other evaluation methods neglect. The assessment of political feasibility is based on an analysis of the probable response of several interest groups to the perceived outcomes of each of the land use control measures. (Snyder-Cal)

AN ASSESSMENT OF THE ON-SITE WASTE WATER MANAGEMENT PROGRAM IN THE STATE OF MAINE,

Maine Univ. at Orono

Available from the National Technical Information Avanaor from the National Technical morthaton Service, Springfield, VA 22161 as PB80-139579, Price codes: A08 in paper copy, A01 in microfiche. MS thesis May 1979. 162 p, 3 Fig, 25 Tab, 55 Ref, 5 Append, OWRT A-046-ME(I).

Descriptors: "Maine, "Waste water treatment, "Land use, "Regulation, Legal aspects, Plumbing, Inspections, Surveys, Administration, Manage-ment, Water policy, Municipal wastes, Waste dis-posal, Water pollution.

On-site waste water management proggram appli-cations of the Maine Plumbing Code were studied to clarify the relationship between plumbing regu-lations and land use activity and to determine the perspective of the local plumbing inspector. State and local approaches to on-site waste water management programs administration and regulation were also studied. Results of a telephone survey of local plumbing inspectors were used to determine the role of the local inspector in Plumbing Code implementation. The Plumbing Code is widely accepted and meets local community needs 90% of the time. However, many communities are relying too heavily on the Code and are using it as a land use regulatory device. Maine's on-site waste water management program could be improved by providing additional local inspector training in the actational local inspector training in the areas of land use and regulatory techniques along with more technical training in waste water disposal. Also, the reimbursement policies for local inspectors needs to be upgraded due to the technical aspects of the position. Other improvements are needed in the areas of funding, legal assistance, and municipal support for the inspectors. The Plumbing Code should be more formally linked to the Building Code and should involve contractors to the proper installation of disposal systems. Maine continues to have an on-site rather than a centralized approach to waste water treatment. (Seigler-IPA) W80-03083

THE POLITICS OF IRRIGATION: AN EMPIRI-CAL TEST OF DEMOCRACY IN GREAT PLAINS RESOURCE DISTRICTS,
Kansas Univ., Lawrence. Dept. of Political Sci-

JMI

C. O. Heatwole.

Available from the National Technical Information Service, Springfield, VA 22161 as PB80-139587, Price codes: A18 in paper copy, A01 in microfiche. Doctoral dissertation, May 1979, Volumes I and II, 406 p. 36 Fig. 68 Tab, 208 Ref, 2 Append, OWRT B-046-KAN(1).

Descriptors: *Political aspects, *Local governments, *Irrigation districts, *Groundwater mining, Texas, New Mexico, Kansas, Nebraska, Colorado, Great Plains, Governments, Water policy, Agriculture, Decisionmaking, Administration, Democracy, Grass roots.

Resource districts in the Great Plains states of Texas, New Mexico, Kansas, Nebraska, and Colorado are examined as examples of a decentralized form of government and how this decentralization effects democracy. Presumably these decentralized units of government provide the conditions, par-ticipation, responsiveness, and accountability, needed for realizing the democratic ideal. Re-

source districts were formed in many Great Plains states to deal with the serious natural resource problem of groundwater mining. The irrigation based economy of the Great Plains has forced farmers to maximize production regardless of prices or ecological concerns. Using these resource districts the claims for and against grass roots structures are analyzed. These special districts are described in detail including their history, types, numbers, functions, and structure. Highly autononumbers, functions, and structure. Highly autonomous and functionally general districts are emphasized. Optimistic and pessimistic views are given for the districts in terms of responsiveness, accountability, and participation. Mixed results fail to wholly substantiate either viewpoint. The 'democratic theory' is not borne out by the study results. (Seigler-IPA) W80-03086

TOWARD A NATIONAL PROGRAM FOR RURAL WATER-SEWER DEVELOPMENT: THE BASIC ISSUES,

National Demonstration Water Project, Washington, DC.

S. Zimmerman

In: Water Problems in the Rural Environment; Alternative Solutions for Water Supply and Wastewater Disposal. Proceedings of a Conference Held at Lincoln, Nebraska on November 4-5, 1976.

Descriptors: *Governments, *Sewerage, *Water supply development, *Rural areas, *State govern-ments, Federal governments, Local governments, Regulation, Governmental interrelations, Water supply, Water conveyance, Community develop-ment, Domestic water, Potable water, Water qual-ity, Government finance, Costs, Financing.

State governments must take a stronger stance than they have in the past in regard to rural water development. Although many agencies deal with only one area (health standards, rates, financing, or only one area (neath standards, rates, mancing, or planning), interrelatedness must be recognized to correct past problems. As many as 30 million people do not have adequate domestic water or wastewater disposal facilities. Need is greater in the southeastern U.S. although it exists in virtually all parts of the country. Rural residents need adequate to the country of the countr quate water-sewer facilities at rates they can afford. For water-sewer development to occur, local attitudinal factors must be considered and significant community groups identified. The federal government finances and regulates rural water and sewer development through the U.S. Department of Agriculture's Farmers Home Administra-tion and the U.S. Environmental Protection Agency. Federal agencies presently provide the bulk of outside financing local communities re-ceive. Financial assistance programs for water sys-tems are also sponsored by 16 states. Community tems are atso sponsored by 16 states. Community water system supply design, operation and output are usually monitored by state health departments. State coordinated programs for rural water-sewer development should include: local level development with state assistance; financing from all government levels with federal funds channeled through state governments; and state regulations operating under federal guidelines. (See also W78-11244) (Danovich-Wisconsin) W80-03125

RURAL WATER: STATE-FEDERAL RELA-TIONSHIPS, North Dakota State Senator, Solen.

F. Barth.

F. Bartn.

In: Water Problems in the Rural Environment;
Alternative Solutions for Water Supply and
Wastewater Disposal, Proceedings of a Conference
Held at Lincoln, Nebraska on November 4-5, 1976.

Descriptors: *Federal government, *North Dakota, *Water supply development, *Rural areas, *Governmental interrelations, *Legislation, State governments, Water supply, Domestic water, Potable water, Costs, Water quality, Water resources development, Government finance, Political aspects, Inter-agency cooperation, Institutional constraints

This paper discusses bills presently before the North Dakota legislature regarding rural water system projects and problems in coordinating state programs with federal agencies. Two draft bills approved by the Committee on Agriculture were introduced to the 1977 legislative assembly. The community water facilities loan act provides \$10 million to supplement federal money for construction or improvement of community water facilities. The second bill relates to community water facility grants. Grants may not exceed \$250,000 or 10% of total project costs; \$5 million is to be appropriated. These two bills enhance prospects for better coordination between state programs and federal agencies. The federal Farmers Home Administration program is one of the best which meets rural citizen's needs; however certain agricultural states tion program is one of the best which meets rural citizen's needs; however certain agricultural states such as North Dakota receive insufficient grants. Demonstrating economic feasibility for each system in rural areas is difficult. North Dakota has close liasion capacity with the Bureau of Reclamation which provides financial and engineering assistance for community and rural water systems. The Apple Creek Diversion takes water from the Missouri River and supplies three counties with domestic and irrigation water. Better coordination is presently needed with federal agencies such as Housing and Urban Development, Environmental Protection Agency, and Economic Development Assistance Program. (See also W78-11244) (Danovich-Wisconsin) vich-Wisconsin) W80-03128

LEGAL PROBLEMS FACING RURAL DOMES-TIC WATER USERS, Nebraska Univ., Lincoln. Dept. of Agricultural

In: Water Problems in the Rural Environment; Alternative Solutions for Water Supply and Wastewater Disposal. Proceedings of a Conference Held at Lincoln Nebraska on November 4-5, 1976.

scriptors: *Rural areas, *Water law, *Water Descriptors: *Rural areas, *Water law, *Water rights, *Nebraska, Preferences(Water rights), Water supply, Wells, Nitrates, Water pollution sources, Fertilizers, Irrigation, Domestic water, Regulation, Priorities, Prior appropriation, Agriculture, Municipal water, Irrigation water, Industrial water, Judicial decisions.

This paper focuses on Nebraska Law and three This paper focuses on Nebraska Law and three rural water user issues: (1) water for municipalities and industry, (2) rural domestic water rights, and (3) nitrate pollution of groundwater supplies. Need for more governmental water regulation is suggested. In western states which follow appropriation in the discusses express waters are severed. ed. In western states which follow appropriation rights, disputes among surface water users are resolved by the priority system. An exception to priority is the preference system which settles disputes among different war user classes. Typically, priority is given to domestic, then agriculture, and finally to industrial users. A problem frequently encountered is that municipal use is not recognized or if a municipality dispute water to an industry. It's or if a municipality gives water to an industry, it's status as a domestic user is threatened. Another problem with the appropriation doctrine is that instream water uses, such as stockwatering, are not recognized. Conflicts with ranchers and irrigators have arisen and Nebraskan courts affirmed stockwatering as a domestic water use over irrigation. Conflicts have also arisen in Nebraska over loss of artesian pressure. In court cases, irrigators who pumped large water amounts and lowered the water table were liable for the loss of pressure to domestic well users. Nitrate groundwater pollution is increasing due to increased irrigation development. Excessive nitrates cause infant cyanosis and adversely affect plant and animal growth. Control strategies include restricting amounts of fertilizer used by farmers or amounts of water used in irrigation. (See also W78-11244) (Danovich-Wisconsin) W80-03133

EXECUTIVE SUMMARY: WORKSHOPS ON TECHNOLOGICAL ASPECTS,

Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering,
For primary bibliographic entry see Field 6D.

Ecologic Impact Of Water Development-Group 6G

W80-03135

EXECUTIVE SUMMARY: WORKSHOPS ON SOCIO-ECONOMIC ASPECTS, Nebraska Univ., Lincoln. Dept. of Agricultural Economics. For primary bibliographic entry see Field 6C. W80-03136

THE ECONOMICS OF THE EASTERN BLOCK OCEAN POLICY,
Washington Univ., Seattle. Inst. for Marine Stud-

V. Kaczynski.

American Economic Review, Vol 69, No 2, p 261-265, 1979. 1 Fig, 1 Tab, 13 Ref.

Descriptors: *Marine fisheries, *Economics, *Fish harvest, "Socialist countries, Oceans, 200-mile eco-nomic zone, Costs, Economic efficiency, Commer-cial fishing, Fishing fleets, Poland, East Germany, Soviet Union, Bulgaria, Rumania, Fuel.

The development of marine fisheries of the Eastern bloc countries is analyzed. Recent trends in use of ocean resources by socialist countries show that:

(1) During the first half of the 1970s, they rapidly increased their share of the total world harvest of marine organisms. (2) The rate of growth of the catch volume was many times higher than that registered during the same period by world fisheries. (3) Beginning in 1976 socialist fishing nations showed a sharp slowdown in the rate of increase of their catch. A high degree of technological flexibilshowed a sharp slowdown in the rate of increase of their catch. A high degree of technological flexibility and adaptability, utilization of underutilized commercial species, well-developed maritime industries, particularly ship-building, and development of large factory trawlers are primarily responsible for this expansion. However, the magnitude of the Eastern ocean-going fleet reflects a massive investment and commitment to the exploitation of ocean fisheries. On the eve of widespread implementation of the 200 mile economic zone. 50. into no ocean inseries. On the eve of widespread implementation of the 200-mile economic zone, 50-70% of their marine resources came from fishing grounds located 2000 to 9000 miles from their home ports with the most important of these under the jurisdiction of developed Western nations. Fuel consumption has been the single most important consumption has oeen the single most important cost item in fleet operation presently constituting over 20% of total harvesting outlays. At the same time, legal limitations and depletion of the traditionally harvested species have reduced fishing opportunities. The current state of Eastern fisheries is a which degrees the contract of the current state of the curre in which decreasing growth rates in catch are accompanied by disproportional increases in costs of ocean fisheries, has become a heavy economic burden for socialist governments. (Luedtke-Wisconsin) W80-03138

EFFICIENCY IN THE USE OF WATER FOR IRRIGATION: THE ROLE OF PRICES AND REGULATIONS, United Nations Centre for Natural Resources, Energy and Transport, NY. For primary bibliographic entry see Field 3F. W80-03140

200-MILE ECONOMIC ZONES -- FISHING LIMITS AND THE E.E.C., Carlton Univ., Ottawa (Ontario).

J. I. Prattis.

Maritime Policy and Management, Vol 5, No 4, p

Descriptors: *200-mile economic zones, *Interna-tional waters, *Jurisdiction, *Economic impact, *Fisheries, *Law of the Sea, Economic justifica-tion, E.E.C, Governments, International commis-sions, International law, Regulation, Atlantic Ocean, Permits, Political aspects, Foreign waters, Commercial fishing, Legal aspects, Oceans.

International effects of 200-mile offshore fishing anternational effects of 200-mile offshore fishing and economic exploitation zones by coastal nations are discussed. Factors underlying the unilateral declaration of these 200-mile zones by many nations in January 1977 (following Iceland's historic examples in 1975) include: (1) general ineffective-

ness of various international commissions concerned with conservation of fish stocks; (2) failure of various UN conferences on the Law of the Sea to arrive at any kind of consensus on international fishing limits; (3) rapid depletion of fish stocks on which certain countries depend for a major share of their gross national product. Problems created by this new policy have forced the E.E.C. to formulate an external fisheries policy and an internal fisheries system. The external fisheries policy is primarily concerned with phasing out of third-country fishing in E.E.C. waters, controlling access to the E.E.C. 200-mile zone by licenses, and securing reciprocal agreements to fish in third-country economic zones. The internal fisheries policy is concerned with harmonization of the E.E.C. fishing industry and this area of policy has caused considerable conflict between member states of the Common Market. Problems of the new policy include: (1) There is a danger that harmonization and regularization of the entire E.E.C. community fishing industry may be to the detriment of particular coastal areas entirely dependent on fishing. (2) Conflict in policy preferences with E.E.C. prevents negotiation of multilateral fishing agreements and create an air of uncertainty, a constraint on planning and investment in the industry. (Harris-Wisconsin)

6F. Nonstructural Alternatives

ALTERNATIVE WATER SUPPLY SYSTEMS IN RURAL AREAS, Iowa State Univ., Ames. Dept. of Civil Engineer-

For primary bibliographic entry see Field 6B. W80-03130

6G. Ecologic Impact Of Water Development

THE IMPACTS OF RURAL WATER SYSTEMS IN NORTH CAROLINA: AN EXPLORATORY STUDY.

North Carolina Univ. at Chapel Hill. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6C.
W80-03003

DROUGHT AND MIGRATION: THE LAKE MALAWI LITTORAL AS A REGION OF REFUGE, Dalhousie Univ., Halifax (Nova Scotia). Dept. of

African History.

African history.
J. B. Webster.
In: Proceedings Symposium on Drought in Botswana, June 5-8, 1978, Gaborone. Published by the Botswana Society in collaboration with Clark University Press. p 148-157, 1979. 2 Fig, 20 Ref.

Descriptors: *Droughts, *Migration patterns, *Populations, Africa, Climatology, Distribution patterns, Spatial distribution.

The history of migrations into the Lake Malawi littoral is surveyed and coordinated where possible littoral is surveyed and coordinated where possible with known or suspected droughts in Central Africa. Nile levels, tree rings, documentation, and oral history moving chronologically backward beginning in the late 18th century and ending about 1285, are used in support of the postulation that the Lake Malawi littoral was seldom subjected to drought severe enough to force people to emigrate therefrom, but that Central Africa has witnessed droughts of such lengths and intensity that numerous peoples have been compelled to migrate into the area for survival. Although it is not suggested that drought was the only causal factor in the displacement of people, this paper clearly demonstrates the cause and effect relationship between climate and migration over 500 years of African history. (Tickes-Arizona)

UTILIZATION OF MUNICIPAL SEWAGE EF-FLUENT AND SLUDGE ON FOREST AND DIS-TURBED LAND.

Proceedings of Symposium held in Philadelphia, PA, March 21-23, 1977. Edited by Sopper, W. E. and Kerr, S. N., 1979. 547 p. Pennsylvania State University Press, University Park. OWRT A-999-

Descriptors: *Sewage effluents, *Irrigation effects, *Vegetation establishment, *Wildlife habitats, Forest management, Litter, Revegetation, Coal mine wastes, Vegetation effects, Ecology, Food chains, Chemical analysis, Soil physical properties, Infiltration, Microbiology, Public health, *Land application, *Wastewater disposal.

Text of forty-four papers presented at the sympo-sium in Philadelphia is given. The papers review current knowledge related to the economic and environmental feasibility of applying treated mu-nicipal sewage effluent and sludge to promote forest land production and to rehabilitate disturbed forest land production and to rehabilitate disturbed surface mining areas. The current surge of interest in land application of treated waste water and sludge is stimulated by the energy crisis, increasing scarcity of mineral resources, the rising costs of commercial fertilizer, and new pollution and reclamation regulations. Seven topic areas covered under waste water and sludge application are: water quality and renovation, microbiological aspects, vegetation responses, forest soils, other ecosystem responses, public health, and system design and economics. Five areas covered under disturbed land revegetation are: sludge application and economics. Five areas covered under distributed land revegetation are: sludge application methods, water quality and vegetation responses, microbiology and public health, domestic animals and wildlife, and guidelines and regulations. (See W80-03090 thru W80-03093) (Seigler-IPA)

EFFECT OF SPRAY IRRIGATION OF TREATED MUNICIPAL SEWAGE EFFLUENT ON THE ACCUMULATION AND DECOMPOSITION OF THE FOREST FLOOR,

Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources. J. L. Richenderfer, and W. E. Sopper.

In: Utilization of Municipal Sewage Effluent and Sludge on Forest and Disturbed Land, p 163-177, 1979. 12 Tab, 19 Ref. OWRT-C-5169(4205)(3).

Descriptors: *Forest management, *Humus, *Irrigation effects, *Sewage effluents, Forestry, Erosion, Pine trees, Conifers, Hardwood, Deciduous trees, Decomposing organic matter, Degradation(Decomposition), Sludge disposal, Nitrogen, Litter, Leaves, *Land application, *Wastewater disposal, *Spray irrigation.

Treated municipal sewage effluent from a Pennsylvania State University treatment plant was used to vania State University treatment plant was used to study the effect of effluent spray irrigation on forest floor accumulation and decomposition in two forested areas, a mixed-hardwood stand and a red pine plantation. Irrigated and control plots of 0.20 ha were located in each forest area and waste water was applied weekly from 1963 to 1975. Application amounts varied from 2.5 cm/week to 3.8 cm/week applied over single four hour periods. In each plot, both irrigated and control, the fol-lowing were measured: (1) depths and amounts of lowing were measured: (1) depths and amounts of forest floors, (2) amounts of annual litter fall, (3) forest floor decomposition rates, and (4) environ-ment and chemical factors affecting decomposition ment and chemical nations affecting decomposition rates such as moisture, temperature, and carbon/nitrogen litter ratios. Results show that irrigation of effluent significantly reduced depth and amount of forest floor in both forests, however, there was no significant effect on annual litter fall amounts. The observed forest floor reductions were caused by increased decomposition rates resulting from increased moisture content, temperature, and higher total nitrogen levels caused by the effluent irrigation. The red pine irrigated plot had a 66% reduction in depth while the hardwood plot had a larger loss at 77%. This loss of forest floor cover ld ultimately affect the physical and hydrologic properties of the soil due to increased exposure to raindrop impact which in turn would affect inflitation capacity resulting in increased overland flow and erosion. (See also W80-03089) (Seigler-W80-03090

Group 6G-Ecologic Impact Of Water Development

EFFECT OF MUNICIPAL WASTEWATER IR-RIGATION ON THE PHYSICAL PROPERTIES OF THE SOIL

OF THE SOIL, Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources. W. E. Sopper, and J. L. Richenderfer. In: Utilization of Municipal Sewage Effluent and Sludge on Forest and Disturbed Land, p 179-195, 1979. 20 Tab, 1 Ref. OWRT-C-5169(4205)(4).

Descriptors: *Irrigation effects, *Sewage effluents, *Soil physical properties, *Porosity, *Infiltration, Soil stability, Capillary action, Drainage effects, Percolation, Permeability, Soil classification, Soil water movement, Irrigation practices, Irrigation water, *Land application, *Spray irrigation.

Two soil types at sites near Pennsylvania State University were used to study the effect of waste water irrigation on the infiltration and percolation capacities of the soils. One soil type, Hublersburg silt loam has a silt loam topsoil with silty clay or clay subsoil giving moderate to moderately rapid permeability. The other soil type is in the Morrison and Gatesburg series with moderately rapid to very rapid permeability. Study areas were used representing six vegetative cover types, a reed canarygrass area, a corn field, an old field area, a mixed hardwood forest area, and a red pine plantation. In a each area there were 0.20 ha control and mixed hardwood forest area, and a red pine planta-tion. In a each area there were 0.20 ha control and treatment plots getting weekly applications of sewage effluent. Measurements were taken in the treated and control plots for infiltration capacities using a double-ring infiltrometer and an Alderfer-Robinson-type infiltrometer; percolation capacity; total capillary and noncapillary porosities; bulk density; water stability index of soil aggregates; and root mass content. Results show that spray irrigation of effluent significantly reduced infiltrairrigation of effluent significantly reduced infiltra-tion capacities in the Hublersburg silt loam in both forested areas and in the reed canarygrass area while increasing infiltration in the corn area. Percolation capacities were not significantly affected in the agricultural or forested soils, however, per-colation capacities were reduced on all effluent colation capacities were reduced on all effluent irrigated areas in the agronomy and old field plots. Total or capillary porosities and bulk density were not significantly affected. Agricultural and old field areas experienced reduced water stability and both agricultural areas had lower root masses in treated plots. (See also W80-03089) (Seigler-IPA) W80-03091

EFFECTS OF MUNICIPAL WASTEWATER IRRIGATION ON WILDLIFE AND WILDLIFE HABITAT.

Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.

R. G. Anthony, and G. W. Wood In: Utilization of Municipal Sewage Effluent and Sludge on Forest and Disturbed Land, p 213-223, 1979. 2 Fig. 11 Tab, 8 Ref. OWRT B-059-PA(6), B-084-PA(5).

Descriptors: *Irrigation effects, *Sewage effluents, *Wildlife habitats, *Wildlife, *Vegetation effects, Deer, Song birds, Birds, Ecology, Food chains, Oak trees, Pine trees, Vascular tissues, Shrubs, Brush, Browse utilization, Plant groups, *Spray irrigation, *Land application.

Mixed oak and aspen/pine/shrub habitats were used to study the effects of waste water irrigation on vegetation and wildlife at the Pennsylvania State University Wastewater Renovation System. Results show that waste water irrigation effects are dependent on the type of habitat irrigated and the aependent on the type of habitat irrigated and the species of wildlife studied. Various animals and habitats were studied including white-tailed deer, white-footed mice, cottontail rabbits, and song-birds. Waste water irrigation on mixed oak habitats caused the establishment of lush herbaceous growth such as pokement of this neroaccous growth such as pokement of the supplatable to deer. Suitable woody forage was reduced in the irrigated mixed-oak habitats due to ice breakage in winter and increased herbaceous competition in the summer. However, for brush and sapling stands an increase of woody forage plants would stands an increase of woody longs that the beexpected due to increased sprouting from the ice breakage. Irrigation resulted in higher populations of white-footed mice in fall but not in spring. most probably because the increased food from

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herbaceous growth in summer disappeared in winter. Reduced stability and abundance of song-bird populations was observed for irrigated areas. Also songbirds avoided irrigated areas during actual irrigation. For aspen/pine/shrub habitats these observed detrimental effects appear to be less severe than in the mixed oak habitats. A short-term study of heavy metals showed that they were not accumulated in cottontail rabbits or white-footed mice inhabiting irrigated areas. Overall no major detrimental effects on wildlife and habitats were observed due to irrigation. (See also W80-03089) (Seigler-IPA) W80-03092

7. RESOURCES DATA

7A. Network Design

A DISCRETE MODEL FOR THE STUDY OF A LAKE,

Laboratories d'Automatique, Saint Martin D'Heres (France). For primary bibliographic entry see Field 5C. W80-03106

7B. Data Acquisition

MODEL DEVELOPMENT FOR PREDICTING SOIL MOISTURE BY THERMOGRAPHY, South Dakota State Univ., Brookings. Dept. of

J. A. Funneim.

Available from the National Technical Information Service, Springfield, VA 22161 as PB80-140569, Price codes: A04 in paper copy, A01 in microfiche Water Resources Institute South Dakota State University, Completion Report, January 1980. 58 p, 3 Fig. 2 Tab, 22 Ref. 2 Append. OWRT A-063-SDAK(1), 14-34-0001-7088.

Descriptors: *Soil moisture, Thermography, Thermal prospecting, Groundwater, Soil temperature, *Moisture content, Forecasting, Model studies, *Heat transfer.

Experimental and theoretical investigations were earried out relating to the detection and mapping of soil moisture by the use of remote sensed thermal emittance data (thermography). Soil temperamai emittance cata (inermography). Soil tempera-ture profiles, thermal emittance, soil moisture and other pertinent data were collected for test plots under fallow and crop cover conditions. Data were always collected simultaneously for two plots with identical surface conditions but one of the plots irrigated to create different soil moisture profiles. Calculations of surface temperature difference as a Calculations of surface temperature difference as a function of time for these soil moisture conditions were made utilizing a theoretical model. The functional form of the theoretical temperature difference with time were shown to be very close to the experimental apparent temperature difference for both crop cover and bare soil conditions. This result strongly suggests that a technique can be developed by which the effects of near surface soil moisture can be separated from the total thermal emittance data by subtracting the data component having this functional form from total thermal emittance. This component could then be used to maving this timiconal form from four total thermal emittance. This component could then be used to calculate soil moisture differences for group of chosen sites. If soil moisture is measured at one site, soil moisture may be calculated for the other sites. The general nature of additional parameters needed for the present model are also described. (Wiersma-SDAK) W80-03007

7C. Evaluation, Processing and Publication

A THREE-YEAR STUDY OF BENTHOS OF MUDDY ENVIRONMENTS IN PORT PHILLIP BAY, VICTORIA,

Victoria Ministry for Conservation, Melbourne (Australia). Marine Pollution Studies Group. For primary bibliographic entry see Field 2L.

W80-03028

CHARACTERISTICS OF SUBARCTIC SNOW-COVER, Saskatchewan Univ., Saskatoon. Dept. of Geogra-

For primary bibliographic entry see Field 2C. W80-03034

WATER RESOURCES DATA FOR COLORA-DO, WATER YEAR 1978-VOLUME 1. MISSOU-RI RIVER BASIN, ARKANSAS RIVER BASIN, AND RIO GRANDE BASIN. Geological Survey, Lakewood, CO. Water Re-

sources Div.

Available from the National Technical Information
Service, Springfield, VA 22161 as PB80-119944,
Price codes: A19 in paper copy, A01 in microfiche.
Geological Survey Water-Data Report CO-78-1,
August 1979. 415 p, 4 Fig, 4 Tab, 40 Ref.

Descriptors: *Colorado, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Missouri River basin(CO), *Arkansas River basin(CO), *Rio Grande basin(CO).

Water-resources data for Colorado for the 1978 water year consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of wells and springs. This report (Volumes 1, 2, and 3) contains discharge records for about 440 gaging stations; stage and contents of 25 lakes and reservoirs, 5 partial-record flow stations, 75 crest-stage partial-record stations, and 250 miscellaneous sites; water quality for 140 gaging stations and 60 miscellaneous sites; and water levels for 55 observations wells. A few pertinent stations in bordering States are also included in this report. These data represent that portion of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Colorado. (Kosco-USGS)

WATER RESOURCES DATA FOR COLORA-DO, WATER YEAR 1978--VOLUME 2. COLO-RADO RIVER BASIN ABOVE DOLORES

Geological Survey, Lakewood, CO. Water Resources Div.

sources Div.

Available from the National Technical Information
Service, Springfield, VA 22161 as PB80-119951,
Price codes: A18 in paper copy, A01 in microfiche.
Geological Survey Water-Data Report CO-78-2,
June 1979. 394 p, 4 Fig, 4 Tab, 40 Ref.

Descriptors: *Colorado, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Colorado basin above Dolores River

Water-resources data for Colorado for the 1978 water year consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs, and water levels and water quality of wells and springs. This report (Volumes 1, 2, and 3) contains discharge records for about 440 gaging stations, stage and contents of 25 lakes and reservoirs, 5 partial-record flow stations, 75 crest-stage partial-record stations, and 250 miscellaneous sites; water quality for 140 gaging stations and 60 miscellaneous sites; and water levels for 55 observation wells. A few pertinent stations in bordering States are also included in this report. These data represent that portion of ment stations in bordering States are also included in this report. These data represent that portion of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Colorado. (Kosco-USGS) W80-03150

WATER RESOURCES DATA FOR COLORA-DO, WATER YEAR 1978--VOLUME 3. DOLO-

Evaluation, Processing and Publication—Group 7C

RES RIVER BASIN, GREEN RIVER BASIN, AND SAN JUAN RIVER BASIN. Geological Survey, Lakewood, CO. Water Re-

sources Div

sources Div.

Available from the National Technical Information
Service, Springfield, VA 22161 as PB80-119969,
Price codes: A19 in paper copy, A01 in microfiche.
Geological Survey Water-Data Report CO-78-3,
June 1979. 440 p, 4 Fig, 4 Tab, 40 Ref.

Descriptors: *Colorado, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Dolores River basin, *Green River basin, *San Juan River

Water-resources data for Colorado for the 1978 water year consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs, and water water quality of wells and springs. This report (Volumes 1, 2, and 3) contains discharge records for about 440 gaging stations, stage and contents of 25 lakes and reservoirs, 5 partial-record contents of 25 lakes and reservoirs, 5 partial-record fallow stations, 75 crest-stage partial-record stations, and 250 miscellaneous sites; water quality for 140 gaging stations and 60 miscellaneous sites; and water levels for 55 observation wells. A few pertinent stations in bordering States are also included in this report. These data represent that portion of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Colorado. (Kosco-USGS) W80-03151

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1978--VOLUME 1, OHIO RIVER RASIN

Geological Survey, Columbus, OH. Water Resources Div

sources Div. Available from the National Technical Information Service, Springfield, VA 22161 as PB80-115686, Price codes: A17 in paper copy, A01 in microfiche. Geological Survey Water-Data Report OH-78-1, August 1979. 383 p, 2 Fig.

Descriptors: *Ohio, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Ohio River basin.

Water resources data for the 1978 water year for Ohio consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground-water wells. This report in two volumes contains records for water report in two volumes contains records for water discharge at 168 gaging stations, stage and contents at 32 lakes and reservoirs, water quality at 58 gaging stations and 54 wells, and water levels at 30 observation wells. Also included are data for 60 crest-stage partial-record stations and 36 low-flow partial-record stations. Additional water data were collected at various sites not involved in the syscollected at various sites not involved in the systematic data-collection program and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Ohio. (Kosco-USGS)

W80-03152

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1978-VOLUME 2. ST. LAW-RENCE RIVER BASIN.

Geological Survey, Columbus, OH. Water Resources Div.

sources Div.

Available from the National Technical Information Service, Springfield, VA 22161 as PB80-115694, Price codes: A10 in paper copy, A01 in microfiche. Geological Survey Water-Data Report OH-78-2, August 1979. 202 p, 2 Fig.

Descriptors: *Ohio, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment trans-

port, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *St Lawrence River

Water resources data for the 1978 water year for Ohio consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground-water wells. This and water quanty or ground-water Weis. Ints report in two volumes contains records for water discharge at 168 gaging stations, stage and contents at 32 lakes and reservoirs, water quality at 58 gaging stations and 54 wells, and water levels at 39 observation wells. Also included are data for 60 crest-stage partial-record stations and 36 low-flow partial-tracent stations. Additional water data water stages are stations. partial-record stations. Additional water data were collected at various sites not involved in the systematic data-collection program and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Ohio. (Kosco-USGS) W80-03153

QUALITY OF RIVERS OF THE UNITED STATES, 1975 WATER YEAR-BASED ON THE NATIONAL STREAM QUALITY ACCOUNTING NETWORK (NASQAN), Geological Survey, Reston, VA. Water Resources Div.

J. C. Briggs, and J. F. Ficke. Geological Survey open-file report 78-200, May 1977. 436 p, 25 Fig, 14 Tab, 25 Ref.

Descriptors: *Water quality, *Rivers, *United States, *Networks, *Data collections, *Streams, Water temperature, Chemical analysis, Dissolved Geology, Sedimentation. Precipitation(Atmospheric), Water pollution, N Precipitation(Atmospheric), water poliution, Nu-trients, Specific conductivity, Nitrogen, Phospho-rus, Plant populations, Bacteria, Heavy metals, Phytoplankton, Periphyton, Carbon, Radioactiv-ity, Hardness(Water), Biota, Pesticides, Trace ele-ments, Soils, Agriculture, *NASQAN.

The National Stream Quality Accounting Network (NASQAN) was established by the U.S. Geological Survey to provide a nationally uniform basis for continuously assessing the quality of U.S. rivers. Stations generally are at the downstream end of hydrologic accounting units in order to measure the quantity and quality of water flowing from the units. Data are available on a large number of water-quality constituents measured at 345 stations during the 1975 water year. Tempera-ture data (usually continuous or daily measure-ments) from NASQAN stations were fitted to a first order harmonic equation and the parameters for the harmonic function are reported for each station. Considering chemical and biological char-acteristics of U.S. streams as described by NASQAN data, water quality is best (by many standards) in the Northeast, Southeast, and Northwest. Many of these waters show the effects of pollution and carry moderate or high levels of major nutrients. High counts of indicator bacteria also show signs of local pollution. In the Northeast, some heavy metals are at moderate levels, but not above most water-quality criteria. Rivers of most of the Mid-Continent and Southwest reflect the arid or semi-arid climate, erodible soils, and agricultural activities. A special analysis was made to study the patterns of dissolved solids, major nutrients, phytoplankton, and zinc in the Mississippi River above Memphis, Tennessee. (Kosco-USGS) east, some heavy metals are at moderate levels, but W80-03154

POTENTIOMETRIC SURFACE OF THE MIS-SISSIPPIAN AQUIFER IN PARTS OF TRIGG, LYON, CALDWELL, AND CHRISTIAN COUN-TIES, MISSISSIPPIAN PLATEAU REGION, TIES, MISS KENTUCKY,

Geological Survey, Paducah, KY. Water Resources Div. For primary bibliographic entry see Field 2F.

W80-03155

WATER-RESOURCES DATA, 1970-75, FOR PERRIS VALLEY AND VICINITY, RIVERSIDE COUNTY, CALIFORNIA, Geological Survey, Menio Park, CA. Water Re-

Geologi sources Div.

sources Liv.

D. J. Lang.
Available from OFSS, USGS Box 25425, Fed. Ctr.
Denver CO 80225. Printed copy \$17.25, microfiche \$3.50. Geological Survey open-file report 791256, August 1979. 127 p, 8 Fig, 6 Tab, 19 Ref.

Descriptors: "Water resources, "Hydrologic data, "Investigations, "Data collections, Rural areas, Land use, Urbanization, Peak discharge, Precipitation(Atmospheric), Groundwater, Water levels, Water quality, Sediment yield, Storm runoff, Climates, Streamflow, Surface waters, Crest-stage gages, Flood stages, Gaging stations, Rainfall-runoff relationships, Water wells, California, "Perris Valley(CA), "Riverside County(CA).

In 1969 the U.S. Geological Survey began in Perris Valley, Calif., to determine changes in the hydro-logic regime as a rural area becomes urbanized. The investigations spanned several years when pre-cipitation was below normal in most of southern California. Surface-water records were collected California. Surface-water records were collected for a 6-year period at 21 sites, and continuous precipitation records were obtained at four sites. Ground-water levels were tabulated from historical data at selected wells for 1941, 1968, and 1970. Water quality was monitored at several wells in the valley, and sediment data were collected at three surface-water gages. There was little increase in urbanization during the investigation. (Kosco-IISGS) W80-03156

HYDROLOGIC DATA FOR FLOODS OF JULY 1978 IN SOUTHEAST MINNESOTA AND SOUTHWEST WISCONSIN, Geological Survey, St. Paul, MN. Water Resources Div.

For primary bibliographic entry see Field 2E. W80-03158

NEBRASKA WATER-DATA PROGRAMS, 1979. Geological Survey, Lincoln, NE. Water Resources

Div. Available from OFSS U.S. Geological Survey, Box 25425, Federal Center, Denver, CO 80225. Paper copy \$16.25, microfiche \$3.50. Geological Survey open-file report 79-1341, 1979. 121 p, 2 Fig, 1 Tab, 68 Ref, 11 Append.

Descriptors: *Nebraska, *Hydrologic data, *Projects, *Planning, *Publications, Measurement, Streamflow, Sites, Water quality, Groundwater, Floods, Flood plain insurance, Gaging stations, Chemical peals in the control of the control Chemical analysis.

This report contains descriptions of 37 projects of the U.S. Geological Survey and of State agencies represented on the Nebraska Water Data-Coordination Committee. The descriptions include title, name of project leader, agency or agencies involved, statements of the problems and objectives, reports, explained from the organical and plans for volved, statements of the problems and objectives, reports resulting from the project, and plans for 1979. Sources of water-related information are given with names, addresses, and telephone numbers. Also given is a list of selected, relatively recent publications pertaining to Nebraska. Appendices include current measuring sites for streamflow, water quality, and ground-water levels, an index to published streamflow records; a list of flood-prone area maps for Nebraska; and a list of flood-prone area maps for Nebraska; and a list of communities participating in the Federal Insurance communities participating in the Federal Insurance Administration (FIA) flood-insurance program. (Kosco-USGS) W80-03159

OCCURRENCE, QUALITY, AND QUANTITY OF GROUND WATER IN WILBARGER COUNTY, TEXAS,
Texas Dept. of Water Resources, Austin.
R. D. Price.

R. D. Price. Report 240, November 1979. 241 p, 34 Fig, 11 Tab, 57 Ref.

Descriptors: *Groundwater, *Data collections, *Texas, *Water quality, *Aquifers, Groundwater

Field 7—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

availability, Water supply, Aquifer characteristics, Water table, Water levels, Well data, Test wells, Drillers logs, Hydrogeology, Water properties, Chemical analysis, Dissolved solids, Hardness(Water), Chlorides, Iron, Nitrates, Transmissivity, Aquifer systems, Geology, Boron, Precipitation(Atmospheric), Evaporation, Brine disposal, Springs, *Wilbarger County(TX).

Wilbarger County, 954 square miles in area, is located in extreme northcentral Texas and entirely within the Osage section of the Central Lowlands within the Osage section of the Central Lowlands physiographic province. The area lies within the Red River drainage basin with the Red River forming its north boundary and the Pease River dissecting the county and flowing northeast through the central part of the county. The waterbearing units listed in their order of importance are: the Seymour Formation, Quaternary alluvium deposits, and the rocks of the Permian System. The Seymour Formation and Quaternary alluvium deposits are bydrologically connected and usually Seymour Formation and Quaternary alluvium deposits are hydrologically connected and usually function as a single aquifer. The yields of the wells range from small to moderate. The quality of their groundwaters ranges from fresh to very saline. Groundwaters of the Clear Fork Group of Permian age are of small yields and are usually highly mineralized. The San Angelo Formation of Permian age reliably yields fresh to slightly saline groundwater in small quantities. Groundwater in Wilbarger County is used for municipal, irrigation, rural domestic, livestock, and industrial purposes. The native groundwater in the principal aquifer in the county, although very hard, is of good quality. Water from this aquifer is suitable for public supplies, irrigation, livestock, and limited industrial uses. (Humphreys-ISWS)

8. ENGINEERING WORKS

8A. Structures

EXTENDED SET OF COMPONENTS IN PIPE NETWORKS.

Waterloo Univ. (Ontario). Dept. of Systems Design. For primary bibliographic entry see Field 8B. W80-03194

ARMOUR UNIT FOR WAVE ENERGY AB-SORPTION.

SURP 110N, C. T. Brown. U.S. Patent No 4,172,680, 10 p, 23 Fig, 9 Ref; Official Gazette of the United States Patent Office, Vol 987, No 5, p 1179-1180, October 30, 1979.

Descriptors: *Patents, *Breakwaters, *Barriers, Coastal structures, Shore protection, Concrete structures, Waves(Water).

A breakwater, or similar structure, is comprised of a core of rubble, and an armouring layer overlying the core. The armouring layer is composed of individual armour units of hexagonal outer crosssection arranged in a honeycomb array. Each of the armour units has an elongated, concrete body the amour units has an eiongated, concrete body with longitudinal through water-passage means so that the porosity of the exposed face of the armouring layer is solely determined by the ratio of the cross-sectional area of the water passage means to the cross-sectional area of the concrete body. (Sinha-OEIS) W80-03207

8B. Hydraulics

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SLURRY FLOW IN PIPE NETWORKS, Kentucky Univ., Lexington. Dept. of Civil Engi-D. J. Wood

D. J. Wood.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 106, No HY1, Proceedings Paper 15132, p 57-70, January 1980. 3
Fig. 3 Tab, 5 Ref, 2 Append.

Descriptors: *Hydraulic transportation, *Slurries, *Pipelines, Networks, Network design, Pipe flow,

Steady flow, Hydraulics, Computer programs, Equations, *Two-phase flow, Coal transportation.

The basic equations for steady-state flow of a solid-liquid slurry in a network of pipes were developed. The equations were expressed in terms of unknown flow rates and solids concentrations for each pipe in the network. Two sets of simultaneous algebraic equations were obtained. These are nonlinear, and a direct solution of the equation sets is not possible. A procedure for solving the equations based on A procedure for solving the equations based on linearization of nonlinear terms was described. This procedure requires several trials and con-verges rapidly. A computer program was devel-oped based on the proposed method and an exam-ple system was analyzed using this program, and the results were presented. (Lee-ISWS)

EXTENDED SET OF COMPONENTS IN PIPE

NETWORKS, Waterloo Univ. (Ontario). Dept. of Systems Design. M. Chandrashekar.

N. CHARDETSBERER.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 106, No HY1, Proceedings Paper 15130, p 133-149, January 1980. 11 Fig. 6 Tab, 7 Ref.

Descriptors: *Networks, *Network design, *Water distribution(Applied), Economic efficiency, Economic justification, Graphical analysis, Pipe flow, Pumps, Valves, Computer programs, Equations, *Check valves, Economic analysis, Matrix methods, Pressure reduction, Sparse matrix method.

Models for an extended set of components encoun-Models for an extended set of components encoun-tered in water-distribution systems were developed based on graph theoretic concepts. It is shown that components such as check valves, pressure-reduc-ing valves, and booster pumps may be included in the system of equations in which junction (nodal) heads are being solved by selecting appropriate admittance values (similar to those associated with simple pipes) indicated by the current operating conditions of the valves. The formulation-solution procedure is based on sparse matrix methods that leads to efficient and economical analysis of water-distribution systems on a digital computer. (Lee-W80-03194

8D. Soil Mechanics

EVALUATION OF MOUND SYSTEMS FOR RENOVATION OF SEPTIC TANK EFFLUENT, Institute for Research on Land and Water Resources Pennsylvania State Univ., University Park. Dept. of Agronomy. G. W. Petersen, and D. D. Fritton.

G. W. Petersen, and D. D. Fritton.
Available from the National Technical Information
Service, Springfield, VA 22161 as PB80-140858,
Price codes: A06 in paper copy, A01 in microfiche.
Research Project Technical Completion Report,
Pennsylvania State University, Dec 1979, 102 p, 19
Fig. 9 Tab, 45 Ref, OWRT B-98-PA (3) 14-340001-7129.

Descriptors: *Permeability, *Pennsylvania, Flow, Laboratories, *Soils, Sites, Design, *Sewage disposal, *Septic tanks, *Construction, *Maintenance, Chemical analysis, Infiltration, Effluents, Adsorption, Percolation, *Elevated sand mounds, *Renovation, Fill materials, *Questionnaire, *Malfunction rates, Column studies, Pressurized distribution, Seed clay, with three Tenes. Sand-clay mixtures. On-site disposal.

Elevated sand mounds were introduced in 1974 and are currently widely used in Pennsylvania for on-site domestic waste disposal. This report de-scribes the project undertaken to assess the effec-tiveness of the systems and to determine the varied conditions under which the systems succeed or fail. Data from questionnaire and field studies indicated that a considerable number of elevated mound systems are malfunctioning throughout Pennsylvania. The rate of malfunction varied regionally and was related to placement of systems on unsuitable sites, construction problems, and to unsuitable soil and site characteristics not defined

in the regulations. In some areas, the designed lateral-plus-vertical flow capabilities were insufficient to dissipate the effluent resulting in malfunctions on sites found suitable under current regulations. Laboratory studies indicated that with sufficient effluent dissipation, adequate renovation should occur within and beneath the mound systems. Column studies showed that the presence of clay in quantities currently meeting PDER standards in a sandy fill did not significantly improve the renovation of septic trank effluent. Siting, design, construction and maintenance recommendations were made for Pennsylvania elevated sand mounds. Many of these recommendations are currently being implemented into the latest revisions of the on-site domestic waste disposal standards of the Department of Environmental Resources.

8F. Concrete

ARMOUR UNIT FOR WAVE ENERGY AB-SORPTION, For primary bibliographic entry see Field 8A. W80-03207

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

GROUNDWATER: NEW DIRECTIONS-WHERE WE'VE BEEN AND WHERE WE'RE GOING,

For primary bibliographic entry see Field 2F. W80-03037

THE MEINZER ERA OF U.S. HYDROGEO-

LOGY, 1910-1940, Nevada Univ. System, Reno. Desert Research Inst. For primary bibliographic entry see Field 2F. W80-0305

WORLD DATA CENTER A FOR GLACIOLOGY (SNOW AND ICE), NEW ACCESSIONS LIST NO. 4. Colorado Univ., Nederland. Inst. of Arctic and

Alpine Research.
For primary bibliographic entry see Field 2C.
W80-03208

10D. Specialized Information Center Services

NETWORKS AND INFORMATION SYSTEMS

NETWORKS AND INFORMATION SYSTEMS FOR DEALING WITH DROUGHT, Clark Univ., Worcester, MA.
L. Berry, and R. B. Ford.
In: Proceedings Symposium on Drought in Botswana, June 5-8, 1978, Gaborone. Published by the Botswana Society in collaboration with Clark University Press. p 165-172, 1979. 2 Tab, 1 Ref.

Descriptors: *Droughts, *Information exchange, *Networks, Planning, Regional analysis, Botswana, Planning, Environment, Monitoring.

This paper outlines information important in dealing with drought as (1) western scientific information, (2) ethno-scientific information, and (3) know-how, or informal technical information. The difficulty of use of diverse sources of environmental information would seem to lie in the translation of a mass of even well-ordered and closely document-ed scientific information into specific development projects. The authors believe that Botswana is in a position of strength from three kinds of informaposition of strength from three sinus or illustration: environmental, natural resource, and drought. Experience has already been gained there in the use of remote sensing for assessing the status of and monitoring change in national resources. Botswara's Tribal Grazing Lands Programme has demonstrated that in rural areas, local people understand

SCIENTIFIC AND TECHNICAL INFORMATION—Field 10

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their local environment and keep track of changes within it. If experiments encouraging simple monitoring of key environmental components, perhaps through schools and/or the establishment of low-cost environmental/drought assessment units composed of part-time people from key ministries and institutions, a great step forward will have been taken toward the use of information in planning. (Tickes-Arizona)
W80-03071

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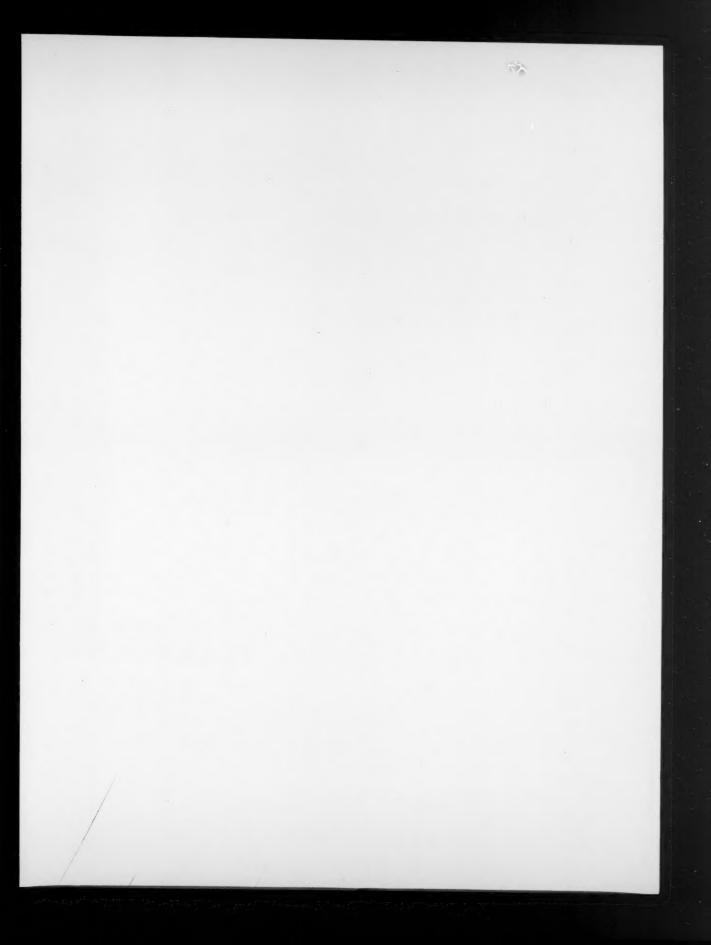
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Α.	CENTERS OF COMPETENCE		
	Illinois State Water Survey, Hydrology	W80-0302603055 03167	61
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В.	STATE WATER RESOURCES RESEARCH INSTITUTES	W80-0300103007 03077 0317203176	13
c.	OTHER		
	Environmental Information Services, Inc. (Effects of Pollutants on Aquatic Life)	W80-0321003224 0322603263 0326703269 0327503280 0328203300	81
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	Ocean Engineering Info. Service (Patents)	W80-03025, 03103 03139, 03143 0319603197 03207, 03225 0326403266 0327003274 03281	17

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